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"THIRTY YEARS AGO."

The prophecies of some of the early electrical men make interesting reading today. Gilliland doubting long distance telephony. Lockwood skeptical of underground wires. Edison criticising the storage battery because of its short life, but which in later years he has done so much to lengthen.

The language of those days, when electrical inventors and toilers were groping for new descriptive terms will cause many of our up-to-date readers to smile. "Electric Plant," was the central station of today, and the power of the Vienna Electrical Exposition was spoken of as "1,000 horses." A constant and puzzling topic was "induction," its nature and remedy soon to be understood and applied.

The following appeared in the "Electrical Notes" in the ELECTRICAL REVIEW of April 26, 1883:

"Great things are to be expected in the future from electricity. The limit of its application is not even in sight, and the wonders that have already been accomplished through this agency give us reason to entertain the belief that this generation shall pass away with the end of electrical development not yet attained."

A generation and a half have "passed away" and the "end of electrical development" is certainly not yet attained.

The total number of United States electrical patents issued for the week ending March 13, 1883, aggregated fifteen; the number of electrical patents granted for the week ending March 18, 1913, numbered eighty-nine.

The inventive electrical mind thirty years ago was devoted largely to electric batteries, the telephone and telegraph, underground wires, incandescent and arc lamps and dynamos, while today the range of invention covers almost every use of power, light, heat, signalling, and a multitude of apparatus ranging from the tiny electric fuse to the electric locomotive of many tons weight and apparently untold power.

The interest in these literal quotations from the ELECTRICAL REVIEW of thirty years ago, which we have been publishing, has been lively and pronounced, and many communications respecting them have come to us, recalling and describing the struggles and experiments of the pioneers who achieved so much and who founded the wonderful and still advancing electrical art and industry of the present day.

BETTERMENT WORK IN SMALL CENTRAL-STATION SYSTEMS.

One of the most noteworthy evidences of progress in the central-station industry is the improved standard of practice apparent in many of the smaller systems on both engineering and commercial lines. In the forward movement of the electrical art, with its frequent development of new generating installations and rearrangement of distribution facilities, the benefits of a policy of betterment are just as apparent among the small companies as in larger organizations, and the study of what has been accomplished in specific cases is often highly profitable. Important as is the tendency toward the consolidation of plants and systems, there is a field for independent co-operative work in many localities which is most attractive, and which, if rightly appreciated, leads the progressive manager of the small company to plan and accomplish far reaching improvements.

In a representative instance a small local company acquired possession of the distributing system in a village about 4.5 miles distant and at the same time took under consideration with a neighboring hydroelectric power company the question of future rates based on a long-term contract with the latter. The village distributing system was in bad condition, and to meet the demands of the new service it was necessary to entirely rebuild the lines, installing new poles and wire throughout. In the original layout the village distribution system utilized feeders and mains of No. 8 copper, with frequent No. 10 house services. This construction proved faulty on the score of mechanical strength, and had to be entirely revamped, No. 4 copper being used in the heavier service and No. 8 on some of the house leads. The No. 10 wiring was entirely abandoned and the copper sold for scrap value; and to meet the requirements of adequate voltage regulation in the face of a rapidly expanding load, the former 2,300-volt line serving the village was rebuilt on a 13,000-volt basis. Energy will shortly be distributed from a local transformer substation in the village and the lighting conditions correspondingly improved.

The relation of the small central-station company to the hydroelectric system from which it purchases service is of interest in view of the bearing of the load-factor of the former upon the rates accorded in the past and upon the discussion of prospective rates on the renewing of the contract negotiations. For a number of years a price of 1.5 cents per kilowatt-hour was charged the central station by the hydroelectric company, but as the business of the latter grew, its management felt that it could no longer afford to make so low a rate in view of the low load-factor of the smaller plant, which was about 15 per cent. The price was therefore increased to 2.5 cents, but in view of the efforts of the small central station to secure new business and improve its load-factor, a trial price of 1.75 cents per kilowatt-hour has been arranged, and if this proves satisfactory, it will probably be applied on a 10-year contract. In connection with the betterments on the system a 15-year contract has been made with a large tool-making concern and another of 100 horsepower for 24-hour paper-mill service. This forthcoming business promises to greatly improve the load-factor, and the relations of these commercial problems to the ultimate price to be agreed upon between the small central station and the hydroelectric company illustrate the influence of a progressive policy throughout the field of the former's service and its supply from the latter. The rewards of good central-station engineering, even on very small systems, are indisputable.

THE ELECTRICAL INSPECTOR AS A TEACHER.

Electrical inspectors as a class are men who favor the promotion of the better types of electric wiring. The efforts of associations of inspectors, and of individual inspectors as well, to discourage the use of the frailer and more temporary types of construction is a continuous and most valuable contribution to the progress of the electrical industry. While the inspector, in the course of his daily duties, may be without authority to insist upon anything more in the work he happens to be inspecting than what is necessary to insure safety, he is usually willing enough to give the wiremen advice in matters where the question of life or fire hazard does not really enter.

This is fortunate and proper provided such advice does not have to be anything further than suggestions given during the regular routine of orderly inspection work. It is extremely unfortunate, however, that the inspector so often finds it necessary to teach incompetents how to do ordinary electric wiring. This is the lot of the municipal inspector, especially in towns and cities where there is no registration nor licensing of electricians. The average property owner makes no claims to electrical knowledge. Unless somebody has gone to the trouble to convince him of the error of such an opinion he is quite liable to take the fact that the lights burn and the wiring does not look bad as sure evidence that the installation is all that it should be. It is not unnatural then that he should become the victim of the cheap wireman when the building is to be wired throughout, or that he should turn the job over to the janitor, the stable boy, gardener or some other equally skilled artisan when extensions to existing wiring or alterations in it are to be undertaken. When wiremen of such types have been employed it usually falls to the lot of the municipal inspector to show them how a great deal of the work is to be done. This is a task that he should certainly not be compelled to assume; it is unfortunate that he cannot always refuse positively to assume it. The electrical inspector acting as superintendent of construction on any job of wiring is entirely out of his place. Such a practice imposes unfair burdens upon him and makes the cost of inspection excessive. More-

over, it encourages incompetent wiremen to enter the electrical contracting business, and thus works a hardship on deserving men in the field.

It may be added in this connection that the methods of inspection described by Mr. Fred Lufkin on another page of this issue may possibly be the best for some very small towns. It is a well known fact that something of this sort is rather common in such places. It is surely not the sort of thing to be encouraged elsewhere.

FEES FOR THE REGISTRATION OF ELECTRICIANS.

The principal reason for the continued popularity of the less substantial types of electric wiring in many quarters is their low first cost. Knowing nothing of the comparative life and maintenance cost of this sort of construction, the patron of electric service is induced to adopt it because of its initial cheapness. Moreover, the cost of wiring is very often one of the most serious considerations when the matter of using electricity in the place of some other form of energy for light or power is taken up with the average consumer. Central stations recognize this when they propose the time-charge plans of payment for wiring so common throughout the country.

It is not intended here to go into any discussion as to the comparative ultimate costs of the various kinds of electrical construction now employed, nor to recommend that low first cost should be a consideration when electric wiring is to be installed. It is meant, however, to insist that any practice which unnecessarily increases the cost of wiring ought to be strongly discouraged. Excessive charges for electrical inspection, for example, make the cost of wiring unnecessarily high and thus impose an unfair burden upon the consumer. They retard the popularity of electric service, moreover, and so cause less wiring to be done and thus hurt the business of the manufacturer, the central station, the contractor, in fact, all branches of the electrical industry.

On another page of this issue will be found a proposed ordinance now pending before the City Council of Chicago which may be fairly challenged in this connection. It is an ordinance to require the registration of electricians working in that city. There is no question that Chicago needs some such law as this; the Inspection Department has long been troubled by the lack of it. But why a man should be required to pay $100 a year to be registered as an electrician with the city does not appear.

The endeavor to prevent inexperienced and incompetent persons from undertaking electrical construction work is a laudable and proper one and such an activity comes within the undoubted scope of the municipal administration. It protects the public from being imposed upon by unreliable contractors, and considerably lessens the burdens of the electrical inspector. With this as the purpose and justification of such a requirement, the motive for attaching a fee as large as that proposed is not apparent. The only logical and legitimate basis for any fee in this connection is the payment of the expense involved in the administration of the law. A charge of five or ten dollars would be amply sufficient to meet this need. Indeed, it is quite probable that the saving of time of inspectors now occupied by repeated inspections of the same job would recompense the city for the cost of issuing certificates.

Granting, however, the necessity for a small fee in this connection, it must be admitted that any amount in excess of that necessary for the carrying out of the purposes of the ordinance is nothing more nor less than an occupational tax—a form of levy so generally obnoxious as to have been forbidden in many states by constitutional provision. Such a tax upon any industry must necessarily retard its growth, for it is ultimately paid by the user of the product concerned. Thus if 150 certificates were issued yearly in Chicago, there would be paid into the city treasury $15,000 per annum. Probably the number would be greater than this. The sum thus collected would be, of course, far in excess of the cost of issuing certificates, and would constitute a contribution from the users of electrical equipment to the general funds of the city, a contribution which should not be demanded from any industry which is recognized as a blessing and not a detriment to the community. And the electrical industry may justly claim a large share in the development of our modern civilization and look forward to still greater achievements.

Can it be that provisions of this sort—and they are not confined to Chicago—are subtle schemes for keeping the electrician who might find it difficult to raise a large sum, out of the construction field, except in a subordinate capacity? This is one possible motive, at least. It might be contended, of course, that a good electrician would be a successful one and that the successful electrician or his employer should have no trouble in paying such a sum as that mentioned. This is by no means generally true. Even if it were so, the consumer who uses the services of the electrician would have ultimately to bear the expense. It would certainly seem that the required assurances of experience and ability, with fees sufficient to cover the cost of registration, ought to be all that is demanded, unless, indeed, certificates are issued only on examination. This would be a much more certain way to exclude the unfit.

It appears that matters of this kind might very well be given careful consideration by the recently organized Society for Electrical Development, since the proposed conditions cannot have any other effect than that of retarding the growth of the electrical industry. Consistent opposition to all such legislation aiming to place a burden upon electrical development might well be undertaken, and should receive the support of the local electrical interests.

New England Section Banquet.

"Something doing every minute," was the keynote of the get-together banquet of "Live Wires" in the electrical business, at the American House, Boston, on the evening of May 2.

The affair was held under the auspices of the New England Section, National Electrical Light Association, and the Boston Edison Company Section. About 300 were present.

During the dinner an orchestra discoursed music, interspersed with popular songs, and moving pictures were displayed on a screen, with occasional portraits of men prominent in the electrical business in New England, whose appearance was greeted with hearty marks of recognition. Other films showed the process of manufacture of electric appliances at the Westinghouse Company's Newark works, and scenes in the Commonwealth Edison Company's shops.

L. D. Gibbs, of the Boston Edison Company, kept things going until the close of the dinner, when President A. F. Townsend, of Woonsocket, R. I., head of the New England Section, assumed the chair and introduced Past-President Howard T. Sands, general manager of the C. H. Tenney Company's lighting properties, who delivered an address on "The Evidence of Things Unseen." The burden of the discourse was the force of the public's relations to a public-service corporation.

"Public-service corporations are often subjected to promiscuous attacks," said the speaker. "These can be turned to account if the central-station man will but think the problem out. Co-operation between the people and the corporation will solve all the difficulties."

The speaker urged promptness, frankness and sincerity as desirable attributes in dealing with the public and suggested that the present railroad situation in New England is beclouded by the fact that the heads of the New Haven Company have not dealt with the public in an open manner.

"But," said Mr. Sands, "the corporation should not do it all; it should receive the same treatment that any other reputable business establishment has a right to expect from the public. It has the right to be successful and pay decent dividends. An unsuccessful public corporation is a nuisance. In dealing with the municipality a lighting company should never jockey, never give free lighting or special rates to gain political favor."

A final requisite to success is the loyalty of all employees, the construction of the Panama Canal being an example of the advantages of wholesouled devotion to the work and the leader on the part of the men who do the work.

An eloquent address on "Edison, the Master and the Man," was delivered by Larne Vredenburgh, of the Boston Edison Company.

The next convention of the New England Section was announced to be held at Hotel Vermont, Burlington, Vt., September 17, 18 and 19, 1913.

Arthur Williams Dined and Decorated.

Trustees and other members of the American Museum of Safety tendered a testimonial dinner at Sherry's on the evening of May 3, at New York City, to Arthur Williams, president of the Museum, on the occasion of his decoration with the Cross of the Order of Isabela la Catolica by Senor Don Juan Riano y Gayangos, envoy extraordinary and minister plenipotentiary of Spain, who was sent to the United States by his sovereign, King Alfonso, to make the presentation.

In reply to the Spanish envoy's speech of presentation, Mr. Williams said that in receiving the decoration he did not look upon it so much in the light of a personal distinction, but rather as a mark of approval of the American Museum of Safety. He announced for the first time publicly that an International Exposition of Safety and Sanitation will be held in New York City some time during next December.

Among the other speakers were George B. Cortelyou, who talked on accident prevention, William H. Tolman, Alexander C. Humphreys and William C. L. Eglin. Among others present were Judge Samuel A. Beardsley, of Utica; Theodore Beran, Charles Blizzard, Philadelphia; Reginald Pelham Bolton, Nicholas F. Brady, Anson M. Burchard, Mr. and Mrs. Everett W. Burdett, Boston; Mr. and Mrs. Henry R. Carse, Robert A. Carter, C. L. Close, W. E. Darby, Joseph P. Day, Senor Don F. Javier de Salas, Norman E. Ditman, Philip T. Dodge, Alex Dow, Detroit; William B. Dowd, Mr. and Mrs. Charles L. Edgar, Boston; Lewis B. Gawtry, Jacob Gimbel, Philadelphia; Otto Glogau, Miss Adele H. Hazen, Dr. and Mrs. Frederick L. Hoffman, Samuel Insull, Chicago; Mr. and Mrs. E. H. Johnson, W. F. Kenny, Richard Kovacs, George F. Kunz, Charles R. Lamb, Frederick G. Lee, Mr. and Mrs. J. W. Lieb, Jr., Mr. and Mrs. C. Alfred Littlefield, Joseph B. McCall, Philadelphia; Emerson McMillin, Charles McKay, Mr. and Mrs. T. C. Martin, Daniel Bradley Murray, Joseph Bradley Murray, Mr. and Mrs. Thomas E. Murray, Sr., Thomas E. Murray, Jr., Mr. and Mrs. Walter Neumueller, R. H. Newbern, Philadelphia; George Norris Mr. and Mrs. George Fox Parker, A. A. Pope, Dr. and Mrs. Louis L. Seaman, M. A. Singer, Mr. and Mrs. James Speyer, Charles E. Spratt, Louis Stewart, Ernest Stauffen, James W. Taylor, Charles G. M. Thomas, Frank Trumbull, P. D. Wagoner, Senor Don Manuel Walls, Washington; Frank D. Waterman, Frederick E. Potter, E. T. Williams, Miss Colyer, Joseph Williams, Hugh M. Wilson, James C. Young, W. E. Freemand, A. A. Anderson, Mrs. A. B. Claflin, Mr. and Mrs. J. Hemmens, Mr. and Mrs. Charles I. Taylor, Emory S. Lyon, Alfred E. Davidson, D. C. Jackson, George R. Sheldon, O. J. Gude, W. F. Wentz, Louis N. Hammerling, E. J. Kenny and Philip Torchio.

Electric Club Inspects Chicago Telephone Plant.

The regular weekly meeting of the Electric Club of Chicago was held, through the courtesy of the officials of the Chicago Telephone Company, in the Bell Telephone Building, where the members of the Club were the guests of the telephone company at luncheon.

H. M. Webber presided at the meeting and introduced B. E. Sunny, president of the Chicago Telephone Company, who welcomed the Club to its quarters and pointed out the intimate relation which the telephone bears to the transaction of business in both office and home. He referred to the quarters provided for the convenience of the employees in the building and pointed out the humanitarian attitude of the progressive corporations of the day toward their employees, as exemplified in the management of his own company.

The rapid growth of the telephone business was illustrated by the fact that while the number of subscribers in Chicago five years ago was less than 165,000 it had reached a figure on April 1 of this year exceeding 318,000. In the same space of time the number of calls per day had increased from an average of about 1,200,000 to 1,800,000.

George C. Keech, president of the Club, was then called upon and made an appropriate response to the welcome of Mr. Sunny.

Homer E. Niesz was also called upon to respond for the Club and expressed the appreciation of the members of the invitation to luncheon and the opportunity to inspect the plant of the telephone company.

At the conclusion of the meeting guides were provided to conduct the visitors through the various portions of the building, where the telephone exchange and the auxiliary equipments of the wire chief and other departments were inspected.

Washington Devereux.

It would seem hard to find a spot in this broad land frequented by electrical men where the name of Washington Devereux was unknown. It has not often been the case that a man, to some degree indirectly connected with the industry, has achieved such national reputation, and the fact is all the more remarkable because of the modesty and unobtrusive character of the gentleman under discussion.

Much has been said and written lately about the matter of co-operation. It is true that a good deal of this co-operation has been conversational in nature, and it is refreshing, indeed, to review the work that has been accomplished by Mr. Devereux in actually affecting red-blooded, virile and vigorous co-operation among the various elements of the electrical industry. As a leader of the Jovian Order in Philadelphia, Mr. Devereux has for years developed a spirit of harmony and co-operation so that the enterprise of the Philadelphia Jovians has become a hallmark in the industry, and cities all over the country are striving to emulate their activity and progress.

Washington Devereux,
Chief of Electrical Department, Philadelphia Fire Underwriters' Association.

Washington Devereux began his electrical career in 1880 with the Bell Telephone Company of Pennsylvania. Since that time he has been constantly engaged in the electrical industry in the United States and the West Indies. He is now chief of the electrical department of the Philadelphia Fire Underwriter's Association. Mr. Devereux is an associate member of the American Institute of Electrical Engineers, a member of the National Electric Light Association, American Electrochemical Society. Illuminating Engineering Society, National Fire Protection Association, National Electrical Code Committee, Business Men's Club of Philadelphia, director of the Civic Commission, member of the Bureau of Mines, and of the Engineers' Club of Philadelphia, being an ex-vice-president of the latter. He is a member of the executive committee of the National Electrical Inspectors' Association, and was Statesman of the Jovian Order for the eastern district of Pennsylvania from October, 1910, to October, 1912. He is the author of the "Electrical Key," the standard work for use of the Electrical Inspection Bureau. He is the originator of the Electrical Conference, which consists of inspectors and district managers of the Philadelphia Electric Company, municipal inspectors, electrical contractors and mechanics, and inspectors of the Philadelphia Fire Underwriter's Association. This conference meets once a month to discuss the regulations and interpretations of the rules of the National Electrical Code, and has demonstrated itself to be highly useful and effective.

Annual Meeting of National Fire Protection Association.

The seventeenth annual meeting of the National Fire Protection Association will be held in New York City on May 13, 14 and 15. There will be sessions each day at 10 a. m. in the convention hall of the Metropolitan Life Insurance Company at Twenty-third Street and Fourth Avenue. On Tuesday there will also be an afternoon session.

The reports of the Electrical Committee, of which F. E. Cabot is chairman, and of the Committee on Controlling Equipments for Electrical Fire Pumps, of which Dana Pierce is chairman, will be made at the session on Thursday morning. The Committee on Signaling Systems, of which Ralph Sweetland is chairman, will also report at this session.

Philadelphia Electrical Conference.

The April meeting of the Philadelphia Electrical Conference was held at the Meter Department Building of The Philadelphia Electric Company on Thursday evening, April 24, and in the absence of Mr. Devereux was presided over by William K. Kerford, secretary.

The paper of the evening was by Robert B. Ely, illuminating engineer of The Philadelphia Electric Company, in which he pointed out the desirability of the electrical contractor familiarizing himself with the principles of good illumination, as it has been estimated that at least fifty million dollars' worth of work in the reconstruction of lighting installations is awaiting the live contractor. Mr. Ely explained the various terms, the photometer and its uses, photometric curves, and the different types of intensive and focusing shades. By means of a "light box," it was very clearly demonstrated just what occurred when a work of art, either painting or sculpture, was improperly illuminated either by means of wrongly colored light or by the rightly colored light placed wrongly. At the conclusion of Mr. Ely's paper, R. H. Silbert, of The Philadelphia Electric Company, gave a demonstration of the type B metal meter board, which is now being used exclusively on all alternating-current installations in Philadelphia up to and including 30 amperes. The electrical contractors present took part in a very spirited discussion about this new device and seemed very much pleased with it. The program for the May meeting will be announced later.

College Course in Industrial Physics.

President Richard C. Maclaurin of the Massachusetts Institute of Technology announces the establishment of a course that will be unique in educational institutions, one in industrial physics. This is the outcome of the need for men trained in physics for the solution of problems that present themselves to the industrial world.

The new course is the outcome of a real need that has been voiced by Theodore N. Vail, president of the American Telephone & Telegraph Company, who has said that more and more business firms find it to their interests to undertake research in chem-

istry and physics, the direct relations of which to their specialties are not always obvious.

In establishing the course, the Institute is a pioneer. In 1882, the Institute established its department of electrical engineering, an outgrowth of the department of physics, and in 1901, anticipating the demand for men specially trained along the combined lines of physics, electrical engineering and electrochemistry, established the first course in the country leading to a degree in electrochemistry.

Boston Motor Car Meeting.

Five new members were added to the Electric Motor Car Club, of Boston, at its dinner-meeting at Hotel Thorndike in that city, on May 1.

F. D. Stidham described a volume he is about to publish which will be of especial value to electric automobilists. It will be entitled "Pastime Journeys," and will contain a description of routes in eastern Massachusetts, Rhode Island, New Hampshire and Maine that are practicable for tourists by electric motor car. There will be a list of charging stations and data concerning historic spots, and the mileage covered by the various routes.

Secretary O. G. Draper announced that a directory of electric-car owners was being compiled, and on suggestion of Albert Weatherby of the Anderson Electric Car Company, the owners will be classified by cities, which will make the list of greater practical value, in that it will enable electric-car owners to locate other users of electrics in any community in which they may be touring and in cases where the tourists need a boost will lead them to public charging stations, or to private facilities if the former are not at hand.

E. W. M. Bailey thought the freemasonry that exists among electric-automobile owners should make them willing to share their private facilities with travellers who might need help.

New charging stations were reported at Biddeford and York, Me., which will make electric touring up the coast from Boston easier than heretofore.

E. S. Mansfield, chairman, reported for the Convention Committee that plans had been matured for the convention of electric vehicle manufacturers, agents and central-station men, together with dealers in accessories, to be held at the Engineers' Club in Boston, May 20 and 21, as forecasted in the issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for April 26. The following addresses will be given:

"The Growing Popularity of the Electric Vehicle," by H. H. Rice.

"Opportunities in the Electrical Field for Electric-Vehicle Development," by F. M. Kimball.

"How the Central Station Can Increase its Electric-Vehicle Load," by prominent central-station man.

"Constructive Criticisms," by E. R. Davenport.

"The Proper Selling of Electric Cars," by an authority on salesmanship.

"What Service Should the Central Station Furnish Owners of Electric Cars?" by L. R. Wallis.

"Advertising the Electric Vehicle from the Manufacturer's Standpoint," by F. N. Carle.

"From the Central-Station Standpoint," E. W. J. Proffitt.

Part of one day will be devoted to an outing at one of the country clubhouses near Boston, a banquet will be held in the evening, and a visit to the General Electric Works at Lynn will probably be arranged for the guests.

"The aim of the conference," said Mr. Mansfield, "is to get the manufacturers here to show what has been done, the difficulties in the field and what we want to do." It is the expectation that central-station men from all New England will be present.

President Baker, Colonel Bailey, D. C. Tiffany and other members discussed the subject of tires, and it was brought out that tires especially adapted for electric automobiles increased the mileage in some cases nearly 100 per cent over that obtainable with tires constructed for gasoline cars.

Already 77 new electric trucks have been registered in Massachusetts this year.

Safe Flight Discussed by the New York Electrical Society.

The New York Electrical Society held on April 30, a meeting devoted to "Safe Flight." T. G. Ellyson, lieutenant in the U. S. N., spoke on "The Flying Boat," and Elmer A. Sperry lectured on "The Application of the Gyroscope to the Flying Machine." The large audience was intensely interested in these presentations.

Lieut. Ellyson's paper treated of the development of aviation in recent years and showed how many of the dangers which had lead to the numerous fatalities in aeroplane flight had been overcome in the "flying boat," and that this machine would in the immediate future be used as readily as the automobile and the motor boat. The subject was illustrated by moving pictures and lantern slides.

Mr. Sperry, who has for some time past been engaged on an elaborate series of experiments in the application of the gyroscope to the flying machine, described the results of many of these tests, and illustrated the development of this new application with many lantern slides. Mr. Sperry concluded his instructive talk by showing a moving picture of the "flying boat" moving along steadily, balanced automatically by the gyroscope.

Annual Convention of Electrical Engineers.

The plans for the annual convention of the American Institute of Electrical Engineers, to be held at the Hotel Otesaga, Cooperstown, N. Y., during the week of June 23, are nearly completed. President Mershon has appointed the following members of the Convention Committee: S. D. Sprong, chairman; Comfort A. Adams, F. C. Bates, A. W. Berresford, H. W. Flashman, W. A. Hall, H. A. Horner, Peter Junkersfeld, J. W. Lieb, Jr., P. M. Lincoln, E. L. Nichols, H. H. Norris, Farley Osgood, A. M. Schoen, W. C. Smith, Paul Spencer, J. F. Stevens, C. W. Stone, J. B. Taylor, J. B. Whitehead.

This committee, in conjunction with the Meetings and Papers Committee, is preparing an attractive program. The Meetings and Papers Committee has accepted the following papers up to date, and the balance of the papers to be presented will be announced later:

"Standardization of Method for Determining and Comparing Power Cost of Steam Plant," by H. G. Stott and W. S. Gorsuch.

"The Electric Strength of Air," by J. B. Whitehead and T. T. Fitch.

"The Positive and the Negative Corona," by W. W. Strong.

"A Theory of Rupture," by F. W. Peek, Jr.

"An Oscillograph Study of Corona," by Edward Bennett.

"Test of An Artificial Aerial Telephone Line at a Frequency of 750 Cycles per Second," by A. E. Kennelly.

"The Behavior of Synchronous Motors During Starting," by F. D. Newbury.

"The Industrial Use of Synchronous Motors on Central-Station Lines," by J. C. Parker.

"Automatic Substations," by H. R. Summerhayes.

There will be a symposium of short papers, including the following titles, submitted by the Educational Committee:

Introduction, by H. H. Norris.

"New National Association of Corporation Schools," by William Henderschott.

"Legislation in Vocational Education," by W. I. Slichter.

"Results Obtained by the Pennsylvania Railroad in Its New Apprentice School," by J. P. Jackson.

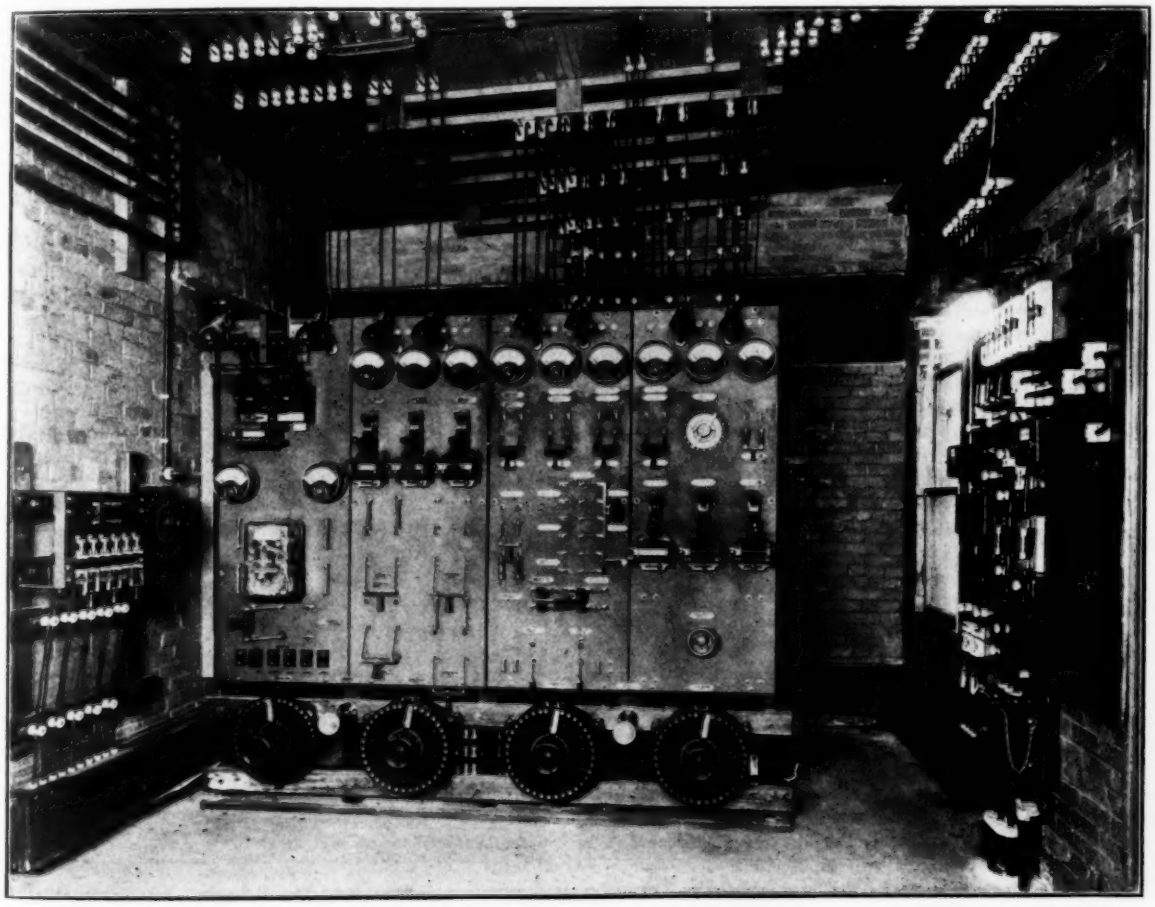
"A Special Feature of Vocational School Work," by A. J. Rowland.

"Vocational Training in the Far West," by William Sibley.

Central-Station Energy for All-Electric Interlocking Service.

A very desirable class of business, having off-peak possibilities, that is seldom thought of in connection with central-station power, is railroad interlocking service. Some recent installations of this type are discussed in this article.

A comparatively recent field for the sale of central-station energy is in the increasing number of all-electric interlockings on steam railroads. The energy is generally used to charge storage batteries furnishing power for the operation of switches, signals, relays indicators, and the lighting of the buildings and the signals. This service is attractive on account of the off-peak possibilities of the load and the number of hours of use. Three installations of this type have been installed on the Boston & Albany Railroad near Boston, Mass.; the largest being located at Riverside where the Newton Lower Falls branch and the westerly end of the Highland branch join the four-tracked main line of the railroad.



West End of Power Room at Interlocking Station.

The installation includes an interlocking tower and a battery building. The former contains on the upper floor a 100-lever interlocking machine, 5 approach and 23 signal indicators, and an electro-mechanical track indicator; and on the lower floor a relay rack equipped with 119 Hall relays. The battery house is a one-story brick structure about 48 by 14 feet in plan, with a concrete floor and foundations, and is divided into two nearly equal power and battery rooms. The latter contains the main battery consisting of 57 400-ampere-hour cells, the track battery including four sets of two 120-ampere-hour cells, and the lock battery, composed of two sets of six 400-ampere-hour cells. The main battery supplies 110-volt current used for operating 29 switch and 39 signal motors and the emergency lighting of 60 signal lamps and the buildings. The switch motors are of one-horsepower capacity. The lock battery furnishes a 12-volt current operating the locking circuits of the switches and signals, the approach and signal relays and indicators, and the electro-mechanical track indicator. The track battery is used on four-track circuits in the vicinity of the tower.

The batteries are placed on wooden shelves arranged in two tiers around the sides of the room, and on the upper level of a platform in the center, accommodating eight cells. The batteries are of sufficient capacity to operate the interlocking plant for ten days without recharging.

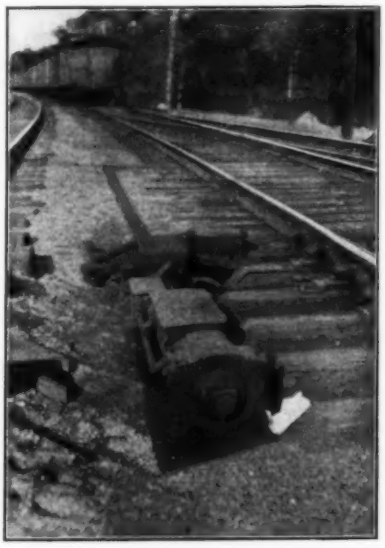
Electric trolley cars are operated on the Newton Lower Falls branch extending about a mile from the junction, and at the depot the electric cars are run upon one of the tracks of the main line necessitating the use of alternating current on these track circuits.

There are two service supplies

brought into the power room, one a 220-volt three-wire single-phase alternating-current connection furnished by the Edison Electric Illuminating Company, of Boston, and the other a 500-volt direct-current circuit taken from the Middlesex & Boston Street Railway Company's lines. The equipment of the power room includes a mercury-arc rectifier, two motor-generators, one a six-kilowatt machine converting single-phase 60-cycle alternating current at 220 volts to 500 volts direct current, and the other a two-horsepower motor-generator receiving 115-volt direct current on the motor side and generating 220-volt single-phase 60-cycle alternating current; and five switchboards. The automatic track batteries, for a distance of seven miles in three directions, east and west on the main line and south on the Highland branch, are charged from this station.

The main switchboard is of slate eight feet long and 5.5 feet wide composed of four panels, a trolley and a motor-generator; east, west and south automatic batteries; and two local charging panels. Directly under the slate board are a general field and three line rheostats. The switchboard is placed at one side and about six feet from the power room partition wall. The signal lighting circuits are controlled from a small switchboard secured to one of the sides of the room near the trolley and motor-generator panel of the main board. There are three circuits leading from the lighting panel, east, west and south as in the case of the automatic batteries. The in-coming circuits are brought into the power room to a wooden board fastened to the wall opposite the lighting panel, and here are placed the main cutouts, fuses, maximum-demand and recording wattmeters. The motor-generators, and the mercury-arc rectifier and alternating-current switchboards are located at the further end of the room. The panel controlling the motor-generators is of slate, and is placed directly opposite the rectifier.

The three local batteries may be charged from the Edison service through the mercury-arc rectifier, or by the motor-generator which also charges the automatic track batteries.



Track Switch Mechanism.

The 500-volt railway current is used to charge both the automatic and the local batteries. The signal lighting consisting of 110-volt, two-candlepower incandescent lamps and the illumination of the buildings may be furnished by either the main battery or from one side of the Edison 220-volt three-wire service. The alternating current required for one of the main line tracks and the Newton Lower Falls branch may be supplied directly from the 220-volt alternating central-station service or from the main battery through the motor-generator. The pressure on the track circuit is reduced from 220-volts to about six volts by means of a transformer.

The feed wires from the motor-generator room to the tower are laid in board trunking. The wires serving the Highland branch are carried from the tower in cables for a distance of about 300 feet whence they are brought to the ground and laid along the tracks. Eighteen-inch vitrified pipe is used to protect the wires leading from the tower under the main-line tracks to a concrete manhole opposite, and from there the wires lead to the trunking. The sizes of the wires are determined by allowing for a 5-per-cent voltage drop on the lines.

An electric searchlight consisting of a 100-watt, 110-volt incandescent lamp placed in a 10-inch parabolic reflector is attached to the site of the tower facing the main line to enable the operator to read the numbers of the locomotives. The current is controlled from the upper floor of the tower and the lamp is kept lighted all night.

A maintainer and two assistants have the care of the installation. An assistant is on duty 24 hours of the day, and the maintainer is employed during the working hours of the day and subject to call at all times. The switch and signal mechanism, and the signal lamps are cleaned every week; the slides and indicator boxes are oiled weekly, and the shafts of the motors are oiled once a month.

About 1,100 kilowatt-hours of energy are furnished monthly by the Edison Company for the operation of the interlocking apparatus, and a similar amount is supplied by the Street Railway Company for the operation of 14.5 miles of four-track automatic signals.

Front View of Interlocking Tower.

Relay Rack in Interlocking Tower.

The plant was installed by the Federal Signal Company, of Albany, N. Y.

Electric Equipment of New Ship.

For the new Cunard liner *Aquitania*, launched last month in England, nearly 7,000 tungsten lamps will be required. This vessel will be equipped with cabin bells, telephones, electric elevators, fire alarms, electrically operated steam whistles, electric clocks, and motor applications of all kinds. There will be four generators having capacities of 400 kilowatts each.

Commercial Practice
Management, Rates, New Business

DOMESTIC APPLIANCES FOR LOAD BUILDING.[1]

By S. D. Levings.

Every central station has a unit in its organization whose business it is to further the sale of current. This unit may be an individual or a group of individuals, and may or may not be segregated. When a group of individuals is segregated it is usually called the New Business Department. But regardless of title, every central station must provide brains and labor for extending the sale of current, not only in newly wired business, but on existing circuits, and it is to the new business getter that I would address my remarks.

I wish to have it clearly understood that I do not think it ethical to take advantage of a privilege like this to advertise any company's wares. But, as Westinghouse service to our customers includes so many necessary details to the successful reaching of the buyer of electrically heated apparatus, that you will have to pardon any reference to the company as being unavoidable and necessary to make the most important points in this paper worth while.

The first thing that comes to the mind is the importance of any device or class of devices. Their relation to the user and central station generally determines this, when other considerations are equal. For example; the electric motor is an A-1 load builder, but the possibilities of sale are limited. Outside of the motor and the incandescent lamp, there is not much to fall back on for load except heating apparatus.

If you have never reduced the facts to figures you have never realized the importance of this apparatus as a load builder. To those who have not I would submit the following interesting facts:

A sad iron consumes 500 watts on the average. It is in use in the average household 10 hours a week counting winter and summer. This means a consumption of 5 kilowatt-hours per week or 260 kilowatt-hours per year. At 10 cents this represents a gross income of $26.00. You can figure your own profits on this, and at a minimum of 10 per cent every sad iron on your lines would earn you $2.60 per year with no added investment on your part.

Assuming that you have 1,000 customers and have sold an iron to 40 per cent of them, you would have a yearly gross income from electric sad irons of $10,400 and at 10 per cent profit a net income of $1,040.

Take the toaster stove, possibly the most popular device ever marketed. The average user will consume at least 3 kilowatt-hours per week, which represents a gross revenue of $15.60 per year or on the above figures $6,240 for 40 per cent of 1,000 subscribers.

These two examples will serve to emphasize the desirability of heating apparatus as a load builder, and doubly so when you consider 95 per cent of it is an off-peak load and just where you want it to increase your average load-factor.

Most central stations see the need of the heating load but do not know concise and effectual methods of obtaining it. In the first place, a commercial policy must be decided upon between four people; first, yourself; second, your consumers; third, the electrical jobbers and dealers in your city; and fourth, the manufacturer.

You must decide whether you are going to invite the co-operation of the dealer in your city by maintaining advertised retail prices. Many central stations, too eager for the revenue from heating apparatus, have disregarded their less fortunate brethren and have cut prices to a point where the dealer cannot compete.

Remember this, your profits really begin when the device is sold. The dealer's profit ends where yours begins, and lives through but one sale, while your meters are clicking off a sale every month as long as the device lasts. The dealer is here to stay. He supplies your customers with their small electrical wants in a way that you wouldn't feel you could. He lifts a large burden from you in this respect and he should have your support in the maintaining of prices so that he can live and make a legitimate profit.

Co-operation is becoming a necessity in successful business. The golden rule is as potent today as 1900 years ago and is more and more becoming a daily rule in the conduct of business.

Anyway this price cutting on the part of central stations is based on a false principal. It has been proven that just as many sad irons can be sold in a given territory at $5.00 as at $3.50, but it takes a little more work. The thing that is cheap in the lower sense of the word loses its value, no matter what it may consist of or do. I know of one case where a central station gave irons away and as a result they promptly were accused of tricking the public into using a device that would double their bills.

Appropos of this subject let me briefly outline the New York Edison plan as it it called. That company maintains several show rooms in Manhattan, in which are displayed the devices of the large and reliable manufacturers. Salesmen and demonstrators are always in attendance and a keen effort is made by various advertising methods to get the people to visit one of these show rooms. Generally a sale is made when they do, and the order is ostensibly given to the New York Edison Company. As a matter of fact the order is not filled by it at all, but is sent to some dealer who handles the device selected and in the neighborhood of the customer.

The Edison Company charges the cost of these salesrooms to general publicity, but in many cases, especially motor sales, the whole matter is handled by them. The Company does not even wire its own stations. Its officials claim that this plan assures them of the co-operation of all the dealers in the city, which in the long run, far outweighs the increased business they might have gotten by selling the devices themselves at cut prices.

The points of policy settled, the problem becomes one of quickly and efficiently getting the devices before the attention of your subscribers and the actual sales made. Most of you are familiar with general methods, so I will not touch on the time-honored "ad" inclosed with the bill, etc., but will put before you what I think will be new and novel methods of getting to

[1] Portion of paper read at convention of Mississippi Electric Association, Natchez, April 22.

the people. I cannot refrain from calling your attention to the service rendered by the large manufacturer along publicity lines. A number of moving-picture machines and reels of film, showing among other things a story called "The Electrical Education of Mr. and Mrs. Thrifty," are supplied by the manufacturer as also a fine collection of model ads for popular advertising. To best get the buyer, strict advantage must be taken of these aids to publicity methods.

These are five good and efficient methods of appealing to the trade which you desire to reach, which may be classified as follows:

(1) National popular advertising, which of course you cannot do, but which the large company does for you and which should always be taken into consideration in the selection of apparatus to sell.

(2) Local popular advertising, which would find outlet in the local newspapers.

(3) Circular letters, which in your case could easily be sent out with your monthly bills.

(4) Circulars, being printed and not written, as distinguished from No. 3, and the distribution for these is usually made by contract with a distributing firm or else under postage without written matter accompanying same.

(5) Personal contact.

The first thing for the publicity department to do is to size up the entire merchandising situation and to determine upon one or more methods of reaching the consumers. This is an important work and great care should be given in considering it. Especially will it be found necessary to differentiate in the methods where the class of customer to be reached is greatly varying in the methods of living, standing in the community, etc.

If you have started on your plan of campaign the next step will be to analyze first, your apparatus, and second, the consumers to which you desire to sell it. These, in most cases will have to be done simultaneously, as one is directly affected by the other.

Let us consider the entire subscriber's list to the central station and the entire line of heating apparatus. We find for example that every user of electricity should be a prospect for the sale of a sad iron, a toaster stove, a coffee percolator, a samovar, chafing dish, sauté pan, frying pan and disk stove. Thus a general canvass can be made of all subscribers to the central-station service, for these devices. When it comes to the dentist's sterilizer the instrument sterilizer, the tailor's iron, laundry iron, solder pot, soldering iron, glue pot, vulcanizer, milk warmer, etc., you will see by a very brief analysis that there is a certain class of trade to be solicited who would apply one of these devices. In each case the name of the device would suggest to you at once the class of trade to which it should be sold. Thus with a very little effort the whole proposition may be rounded out to show the relation between the various items comprising the line and the subscribers to the central-station service.

The most difficult part is to come next: that is, determining the prospects for the individual items such as the disk stoves, soldering irons, glue pots, etc. Classified telephone directory will show you at a glance the entire list of manufacturers that you desire to cultivate in the sale of specialty devices. I realize that many central stations can obtain this information from their own card files, but it is not classified as will be found in the telephone directory and in most cases much time can be saved by the use of the latter.

As an example of the various means which must be taken to secure information on prospects, let us consider the milk warmer. It would obviously be a waste of time and money to circularize all of the subscribers as only a small percentage of them would have a young baby in the house where a milk warmer would be of service. A birth record is kept in the City Hall in your city, or the county seat, which gives the name and address of the parents of every child born, and the date. This information is public and can be obtained for the asking, and a clerk should be sent to the place where it is kept, and all names noted, dating back six months.

This list should be checked up with the accounting department's record to show which of the names listed are consumers of current, and with this information in hand you are prepared to attack the problem of the sale of the milk warmer. You will find that by a concerted effort on this device in a concerted field, the sale of such devices is made comparatively easy.

In this conection I would say a word of praise in favor of the lady demonstrator, as there is no question but what she is more capable of talking about the care of babies, etc., than the circular which you might mail to the mother, and much good work can be done by a clever woman solicitor in this particular regard. Her usefulness does not stop here, however, as she is much better equipped to talk household duties and operations than a man or a circular letter is, and in most cases it will be found profitable to employ a woman solicitor. Those who have not found it so are those who have not segregated their classes of trade as I am detailing to you now, and their efforts have been hit and miss in the territory without any definite object to accomplish. With a known list of 100 babies in the city, the parents of which are using electric light, you should be able to put a woman on this work, and check her results accurately so that you would know what proportion of these 100 have been sold the nursery milk warmer.

I would emphasize the necessity of accurate records concerning the results of any particular campaigns which you put in force. In the case of the manufacturer's sales organization, the information that he is the most desirous of obtaining is why he did not sell the goods, rather than why he did. I am sure that the new-business department of the central station will feel the same way about this, and without records kept on the various campaigns and efforts of individuals to obtain business in classified lines, you will not be able to tell whether you are efficient or not or whether your money has been wisely spent.

In the case of the dentist sterilizer and pint water heater you can from the classified telephone directory obtain the name of every dentist in your city and check his use of electric light from your records. With this in hand the various methods of approaching him can be put into operation and you can in a very short time be able to tell just how many of the total number you are able to sell a dentist sterilizer.

By a careful analysis of the replies to circular letters, etc., and the information obtained through solicitors, you will be able to gradually weed out of your policies those things which are detrimental and in succeeding campaigns can avoid such things.

The tailor's iron can be readily segregated from the other apparatus as can also the list of tailors operating in your community. With the information from the manufacturer concerning the various merits of the particular iron which you are handling, all of these tailors can be approached and in the large majority of cases can be sold.

The laundry iron is equally as easy, of distribution in a segregated class of customers as the tailor's iron and this is one business that has not at all been developed by the central stations in most localities. The arduous labor of ironing during long hot summer days, is very much lessened through the absence of excessive heat by the use of the electric iron and in most cases the proprietors of laundries can be shown the benefits which accrue to their employees through the use of the electric iron to the extent that

they are willing to equip their entire plant with them.

It will be seen by my remarks that it is quite necessary for the new-business department of the central station to work in close harmony with the manufacturer to gain the selling points which the manufacturer must need have in order to dispose of his goods through yourselves and the dealers and jobbers. Services can be had, for instance, in the form of a salesman or a specialist who will be glad to give a lecture with lantern slides and motion pictures to your sales force when they are assembled, and can answer any and all questions that are put to him by your force to enable the latter to conscientiously and efficiently cope with the various situations which confront them from day to day.

The solder pot is a little more difficult to sell in a segregated field than perhaps other items, as there is no one class of trade that can be picked out which will use a solder pot in all cases. It is quite safe to say, however, that all tin shops and machinery working establishments, plumbers, etc., can be sure of using this type of apparatus and by a careful analysis of the trade conditions in your city, you will be able from the classified telephone directory to make up a list of prospects for this device.

The same is true of the glue pot, and perhaps there is no one device in the industrial line that is as popular or can be sold in the same numbers as this device. If you will stop to realize the large number of glue pots that are being used in carriage factories, furniture factories, car-builder's shops, etc., you will see the great advantage of pushing this particular class of apparatus. The writer has in several cases found the salient features of the glue pot are not known to the average salesman, and it is for this very reason that failure has attended any efforts that have been put forth on this device. The greatest talking point of it may be laid to its portability. In the building of cars of all kinds, the timbers in the roof pieces are all glued together and the present method without the use of the electric pot is to have a helper hand up from the bench, which may be anywhere from 10 to 50 feet away, the pot of hot glue which is used until it cools off to a temperature where it is not safe for use. By the use of an electric pot, as long an extension cord as is wanted can be attached to the pot and the glue kept hot at all times at the point of work.

Glue is a very sensative compound, which is not generally appreciated, but if the salesman will take particular pains to study up on glue for a few hours in the public library he will find many valuable points which will enhance the use of the electric glue pot and enable him to efficiently sell it.

The industrial line of heating apparatus is to the writer's mind in its early infancy and will eventually become much more important. It behooves every central station to carefully consider the benefits to be derived from the sale of this class of apparatus. It is easier to sell than household devices as it usually affects a man's business and you are able to show him a saving by the use of the device.

It has been thoroughly demonstrated on the Pacific Coast that wherever a low rate is given the sales of heating apparatus have jumped remarkably. Of course, we realize that current can be sold at a very low rate there but it is becoming very evident to the central stations east of the Mississippi River that it is possible to establish a special heating rate and to increase the revenue by so doing. One of the most enthusiastic plants in this country is the Hartford Electric Light & Power Company, of Hartford, Conn., which is giving a rate of 3 cents per kilowatt-hour between 7 a. m. and 7 p. m., and 1.5 cents per kilowatt-hour between 7 p. m. and 7 a. m., for all industrial heating. The Boston Edison Company has recently put out a new schedule covering the use of heating appliances. The Allegheny County Light Company has recently made very marked reductions in its rate and I may say unqualifiedly that all of these reductions are due to the added load and efficiency to the power plant which have been occasioned by the sale of electric heating apparatus.

One of the phases of this situation that I have not touched upon and one which is quite interesting from a new-business-department standpoint is the window display work which is being done universally by the progressive central stations throughout the country. In these times when agitation is being made for the freedom of the housewife, it is quite possible to get up a very attractive window display which demonstrates the labor-saving power of heating devices and in this way correlate this fact with independence of the housewife of the twentieth century. The writer has found in all of his public demonstration and sales work that this point appeals very much to the average woman and is one that has earned a great deal of business.

From the foregoing you will see that it is comparatively a simple proposition to sell these devices when an analytical study is made of what you have to sell, how you are going to sell it and where you are going to sell it.

Window Display Boosts Tungsten Lighting.

"You May Have A Light House, Too, If You Use Mazdas On Ky-El-Co Current" is the injunction which has been imparted to a multitude of onlookers, accompanied by an extremely novel window display, by the Kentucky Electric Company, of Louisville, Ky. Recently taking occasion to exploit Mazda incandescents, the Kentucky Electric window-trimmers installed a sea-coast scene. A stern and rocky shore was built of paper mache and upon a promontory was erected a paper light-house six feet in height, with a big Mazda burning at the apex. Tossing billows of Mazdas broke upon the beach below this structure, providing a realistic touch appreciated fully only by those who witnessed the sunlight glinting over the turbulent, glassy waters, The Mazda trim was really one of the best, from a publicity standpoint, of a long line of crackerjacks introduced by the Kentucky Electric Company.

Cost of Electric Drive.

In a recent paper before the London Society of Arts, Frank Bailey gave the following typical examples of electric motor drive in the London area. He said that the average cost for each kilowatt connected in these respective cases worked out at $13.75 per annum.

	Kilowatts connected	Yearly cost of energy	Cost per kilowatt connected
Printing (newspaper)	1036	$8800	$ 8.50
Printing (general)	56	580	10.35
Box makers	9	389	43.20
Chemists	92	1040	11.30
Brewers	39	747	19.15
Paint factory	108	1235	11.40
Soap makers	110	333	3.00
Glass makers	18	527	29.25
Blouse makers	13	434	33.40
Wood wool makers	166	3030	18.25
Packing case	52	1040	20.00
Tailors	63	777	12.30
Biscuit factory	265	2040	7.70
Confectioners	174	2770	15.90
Rubber factory	222	1035	4.65
Sawmill	79	1460	18.50
Spice factory	69	1800	26.10
Cabinet maker	87	1462	16.80
Ironfounders	150	4260	28.40
Vinegar brewery	15	980	65.30
Marble masons	101	1430	14.15
Tobacco manufacturers	22	670	30.40
Cold store	164	4480	27.30
Flour mills	51	773	15.15
Ink mills	48	1140	23.80

Electrical Construction

HOW TO FIGURE COSTS IN THE ELECTRICAL CONTRACTING BUSINESS.

By A. J. Burns.

An intelligent accounting system is just as necessary in electrical contracting as is an understanding of the best methods of electrical construction. Proper cost analysis in this profession will do more, in the writer's opinion, than any one thing else to turn a money-losing business into a profit-making one; for no business firm will undertake work at a figure that it knows will cause it to lose money—at least, one would not think so. And yet, there are electrical contractors who will spend good money for boring machines, drilling machines, conduit benders, and other devices designed to save time and lessen the cost of construction work, and at the same time entirely ignore the necessity of an accounting system that will enable them to determine whenever such information is desired, just what their business is earning or losing. They seem satisfied to follow antiquated methods, or lack of methods, that have proved the downfall of so many men in the business. A business that is not making money is losing it, as a rule, and must sooner or later be discontinued. Without an adequate keeping of accounts no contractor can possibly tell whether his business is making a profit or not. As axiomatic as this may seem, experience shows that the truth of the statement is one needing emphasis.

To be of any considerable value, an accounting system must be such that at the close of any period—day, week, month or year—there can be a statement of the business in all its details. It is not enough tnat the costs should go into a few general accounts: there must be an intelligent subdivision of every item of cost, whether of labor or material, or of other expense. No system is worthy of the name nor entitled to confidence which does not classify and properly locate every dollar which passes through the business. Accounting is not simply a record of what has been done; it is a tabulation and classification of all the details of the business. It should include a recapitulation sheet which, by comparison with estimates and work done in previous periods, will show clearly the reasons for loss or profit and thus suggest the best remedy for existing faults in the methods of management.

It would seem that no man gifted with ordinary business sense would offer to undertake an electrical installation for a specified sum of money without having before him full specifications explaining just what he would be expected to do to complete the job. It is a fact, nevertheless, that there are electrical contractors who will take a job at some other man's figure, or what is alleged to be another man's figure, without having estimated the cost of the work themselves at all. Right here the writer wishes to add the caution that the fact that a prospective customer will reveal a competitor's bid to a contractor whom he requests to submit another bid is one that ought to make the contractor exceedingly wary. In cases of this kind the contractor should be especially sure of his figures and that the contract is explicit and binding; for such a customer is quite liable to make good use of any opportunity that may be left him to take unfair advantage of the contractor after the contract has been closed. His method of procedure in placing the contract is pretty sure evidence of a kind of dishonesty.

But, to return from this digression, where there is a system of bookkeeping it is frequently left in charge of incompetents. In the management of a business where decimals determine profit or loss, success or failure, the work of bookkeeping is often done by clerks absolutely incompetent to give those in charge that information so necessary from time to time to insure intelligent management. Very often money is paid out and no record of the payment entered, or labor or material going into some job or other is not properly charged on the books. Such entries, it may be, are postponed, and then forgotten. The contractor cannot be too careful about matters of this sort. He should be just as careful of materials and tools as with cash. It costs money to purchase or replace them. Losing a switch here and a knob there helps to spoil the bank account as surely as if it were dollars and cents that was being lost. It's bad practice, by the way, to allow anybody but the stock man to give out material, and then it should only be given out on a written requisition stating who and what it is for. Thus there may be secured a written record from which to make the charge, and the contractor has a responsible person to call to account for missing material. The same degree of care should be observed, moreover, in giving credit to each job for all material and tools returned; the material should be accounted for whether it comes back as scrap or in good salable shape. There is no other way of arriving at the real cost of the job.

It came to the writer's knowledge once that a certain contractor who specialized on small jobs and was always low on them, was getting all the material he used from a larger contractor through the connivance of a dishonest store-keeper. Careless accounting made this possible. The investigation which was finally started revealed the facts, and the store-keeper was promptly dealt with.

There are about 84 licensed contractors in the city where the writer is located. Only about one-fourth of them have been in the business for any considerable time. While the total number does not greatly decrease, the other three-fourths is kept up by recruits that take the places of men who are constantly being forced out of the business by a lack of money to continue in it. It is proper to assume that these men have money to start with, in small amounts at least. Owing to their lack of business education, they give the money they had to begin with away, and incidentally manage to give considerable sums of the jobbers' money to unpaid bills. If these men had possessed ordinary business intelligence, they would have ascertained as nearly as they could, before going into contracting and investing their money in it, just what the prospects were for them to succeed in this already crowded field. Such an investigation would perhaps have kept nine out of every ten of them from making the venture. The same degree of good judgment would obviously have caused a number of those who did undertake the work to abandon it before

they had lost all that had been put into it.

It is believed that another digression for a word of admonition to credit men is not out of place here. When supply men find that any particular electrical contractor is always below the average in prices submitted for doing specified work, they ought then to insist that this man pay cash for all the materials and supplies he buys. Thus the jobber could be spared the misfortune of having to suffer from the contractor's lack of business ability, and other contractors whose methods are sound not have to submit to the ruinous competition of these men of irresponsible type. Competition with the irresponsible contractor has driven many of succeeding than the practical electrician who lacks knowledge of business principles. A man of former type can easily hire men having sufficient practical and technical knowledge to look after the details of construction.

The foregoing having been written with a view to showing the importance of correct business practice, the writer will now undertake to illustrate what he believes these to be in the matter of making estimates on prospective jobs.

We will assume that the contractor has the money and organization to do the work if he should be so fortunate as to get the contract; it would be evidence that he was lacking in business ability if he should undertake to

TABLE 1—ESTIMATE SHEET.

Architect, Old Building. Address, ———. Owner, ———. Address, ———. Proposal to M. Stevenson. Address, 709 Victor Bldg.

Total Outlets, 92. Total Lamps, 192. Number of Motors, 1. Total Horsepower, 15. Type of Building, Brick. Number of Floors, Five and Basement.

Size of Building, 140x47 feet. Fixtures, Drop Cords only. Special Items, Seven Push-button Flush Switches

Quantity.	Material.	Price per Unit.	Total Price.	Labor.	Total.
1600 feet	½-inch Loricated conduit	$4.56	$72.96	$64.00	$136.96
75 "	1-inch Loricated conduit	7.48	5.61	4.50	10.11
125 "	1¼-inch Loricated conduit	11.66	14.58	7.50	22.08
2000 "	No. 14 duplex wire	27.59	55.18	5.00	60.18
400 "	No. 5 double-braid, rubber-covered stranded wire	103.56	41.42	2.00	43.42
200 "	No. 10 stranded wire	26.58	5.31	1.00	6.31
8	No. 735 panel cutouts	0.66	5.28	1.20	6.48
5	8x8x4-in. steel cabinets with doors	0.87	4.35	2.50	6.85
1	8x10x4 in. steel cabinets with doors	0.92	0.92	0.45	1.37
2	No. 21635 S. N. C. cutouts	0.48	0.96	0.40	1.36
1	No. 13013 triple-pole fused knife switch in steel cabinet	4.50	4.50	1.50	6.00
85	8 B outlet boxes	0.09	7.65	4.25	11.90
32	10-ampere fuse plugs	0.02	0.64	0.64	1.28
3	60-ampere cartridge fuses	0.27	0.81	0.96	1.77
6	30-ampere cartridge fuses	0.12	0.72	0.12	0.84
7	Single switch boxes	0.15	1.05	1.05	2.10
7	Single-pole push-button flush switches	0.38	2.66	0.70	3.36
200	Half-inch locknuts and bushings	.....	9.31	2.33	11.64
192	⅜-inch cap key sockets	0.23	44.16	22.08	66.24
775 feet	No. 18 reinforced lamp cord	0.027	15.55	9.60	25.15
	Incidentals	.....	5.00	2.50	7.50
	Cartage	.....	.....	.....	3.00
	Inspection and permits	.....	.....	.....	16.25
	Liability insurance	.....	.....	.....	30.21
	Total	.....	$298.62	$134.28	$482.36

a deserving one into bankruptcy. Any contractor should be willing to give the credit man, in confidence, information that would enable him to arrive at the cost of any installation that is to be put in. Moreover, it is entirely proper for the credit man to require of the man asking credit a statement as to his finances; it would be just as reasonable as for a banker who is going to grant a loan to ask it.

Electrical contractors are generally men who have been journeymen electricians, or men who are graduates from manual training schools or universities, or they may simply be men who, having money to invest in some enterprise or other, by accident choose the electrical business. Without business training men of either of these classes are almost certain to make a failure of electrical contracting. A good business man without any other training at all stands a better chance get the contract without having these. We will figure the following specifications.

A five-story brick, loft building of the mill type is to be wired in conduit. The conduit is to be placed on the ceilings, and bent around all beams and securely fastened. It is to be put up in straight runs, and all branches are to be made at right angles. The basement and four stories above the first floor are to have two circuits on each floor, placed one-fourth of the width of the floor from the side walls, each circuit to be controlled by switches in the cabinet located at the head of the stairway. There is to be at each outlet one reinforced drop cord with three-eighths-inch cap key socket. The first or office floor is to have six circuits, and certain of the lights are to be controlled by seven push-button flush switches. The contractor is to pay for the inspection and to turn over the job complete and ready for the lamps and connection of the overhead service.

Not having a standard estimate sheet, we will use a form which Arthur Frantzen published in the *National Electrical Contractor* not long ago.

From the Estimate Sheet we find that the labor and material for the job under consideration will cost $482.36, and this gives us two of the three items that enter into the total cost of doing any job of electrical construction. But there is another item that is frequently lost sight of by the contractor in making up his estimate; namely, the cost of doing business. This important item we will now consider.

To simplify matters we will assume that we shall have but the one job during the month. The cost of running our business for a month we will assume to be the following amounts:

Salaries	$100.00
Rent	15.00
Telephone	1.25
Office help	25.00
Insurance	.50
Bad debts	10.40
Association dues	1.00
Repairs	.50
Deductions	1.50
Depreciation	8.00
Automobile or horse hire	10.00
Taxes	5.00
Interest	30.00
Donations and subscriptions	.50
Total	$208.65

Now by dividing $208.65 by $482.36 we find that the cost of doing business is 43 per cent of the cost of labor and materials—the later cost being increased, of course, by the items noted at the bottom of Table 1. Taking the sum of the two items just mentioned, we find that it will actually cost us $691.01 to do the job. But as we are in business to make a profit, we will add 10 per cent for the selling price; this would seem to be the smallest profit, in view of the risk, that a contractor could afford to consider.

The amount $641.55 is found by adding total cost of material ($298.62), total cost of labor ($134.28) and the overhead cost ($208.65), the expense of cartage and inspection and liability insurance being left out of account for the time being. There should be no misunderstanding as to the correct methods of computing profits, and hence we will take this quantity $641.55 and illustrate a fallacious notion some contractors have in the matter. Although the mistake to which we refer is really due to ignorance of arithmetic or to carelessness, it is so common that it should be mentioned here. There are

electrical contractors who obtain their selling price by adding 10 per cent, say, to the sum of the cost of labor and material and overhead, and then imagine that 10 per cent of the selling price is profit. On the contrary, if 10 per cent of the selling price is to be profit, it should not take a mathematician to see that what is not profit amounts to 90 per cent of the selling price. So, to get the selling price in the example just gone through with, we would divide $641.55 by 90 and multiply by 100. Thus it will be found that the selling price would be $712.83. On the other hand, if the sale were to be made at a profit of 10 per cent on $641.55, the selling price would obviously be $641.55 plus $64.15, or $705.70. But it is not true that 10 per cent of this last amount is profit.

It is not meant in the foregoing, of course, that the cartage, inspection fees, liability insurance, etc., are not to be added to the customer's bill. Neither is it insisted that the all various items of cost in the foregoing estimate sheet will apply without numerical modification. The thing that is aimed at especially is to show the contractor who has not already worked out a satisfactory system for himself, an orderly method of making up an estimate. The contractor ought to know what it costs him to install an outlet box, a foot of conduit, or anything else that goes into such installations as he is in the habit of putting in. He should have his unit prices and his cost of doing business figured closely and accurately.

A few men estimate their overhead expenses at from 8 to 10 per cent, while others who have a reliable system of accounting know that this item is from 22 to 25 per cent of the cost of labor and material. Those who imagine their overhead to be so small are often men who do not figure on making any more than if they were working for day wages. Sometimes, too, the services of a member of the family who is assisting with the business are not charged for; or perhaps the interest on the capital invested in the business is left out of account. A certain contractor imagined that he was making $100 a month over and above all expenses. The truth was that he was not charging for his own services nor those of his wife, who spent most of her time in the office.

The expense of carrying the business on is different for different contractors, to be sure; but there is a rule which any contractor can safely follow: Every item for which money or anything else of value is paid, that cannot be charged directly to the job, as labor and material can, should be charged to the cost of doing business. The National Association of Credit Men has recommended the following rules for computing costs and profits:

1. Charge interest on the net amount of the total investment, exclusive, of real estate, at the beginning of the business year.

2. Charge rental on all real estate used in business, at the rate at which it could be let to others.

3. In addition to what is paid out for hired help, charge for the services of members of the firm and of members of their families who may be helping to carry the business on.

4. Charge depreciation on goods where the depreciation affects the selling price.

5. Charge depreciation on tools, buildings and anything else suffering from age or from wear and tear.

6. Charge donations made, association dues, etc.

7. Charge fixed expenses such as taxes, insurance, water, lights, fuel, etc.

8. Charge all incidental expenses, such as drayage, postage, canvassing, advertising, telegrams, telephone rentals, etc.

9. Charge losses of every kind, such as allowances made to customers, bad debts, etc.

10. Charge cost of making collections.

11. Charge any other expense not enumerated above.

12. Having thus determined the total expense for the year, find the percentage cost of doing business by dividing this quantity by the total sales or income from buiness done during the period.

13. Deduct this from the price of any article sold, be it labor or material, and then deduct the cost of the article. Thus the net profit or loss will be found, provided the cost of the article is made to include invoice price and freight.

14. Finally go over the selling price of the various articles handled to see what profits are made on them, with a view to putting the selling on a profitable basis.

The writer wishes to add to these fourteen recommendations a little in the way admonitions of his own to the electrical contractor.

Don't figure on every job you are asked to, unless you know that you can take care of it if you should get it.

Don't take any job at another man's figures; unless they are higher than you own.

Don't figure low on the direct job expecting that you will make up for it on the extras; there may be no extras; besides, if there are, some other contractor may be asked to figure them.

Don't figure any job that you haven't a reasonable idea that you will get if you are right with your figures.

Don't lose any time in getting the work you have on hand completed, in the best manner you know how.

Don't neglect to collect all moneys due as soon as they are due; long drawn payments are a source of loss in interest and friendship.

Don't neglect to have a contract signed in duplicate, one for your customer and the other for your files; it will save much difference of opinion when making settlement.

Don't take any work that will not make you a profit; there will be plenty for you to do without it; besides, there are men who will take what you cannot get, at less than cost.

In conclusion, it may be added that business is simple enough to most people who have never been forced to work for a living. There are others besides these who consider the electrical contracting business extremely simple. They seem to think that what the contractor has to do is to get the contract, do it for money, and keep the money; to do work cheaper or better than his competitor; to know how in advance what the architect or owner wants, irrespective of the specifications; to employ a lot of men, but not more than he must, and pay them what he has to; to get so much work as to dominate the business, or not enough to attract fresh and dangerous competition; to know everything his competitors know, and everything they have done, are doing, may, can, will, must; or are threatening to do and at the same time keep similar knowledge about himself away from these same competitors; to impel bankers to beg for his account; to educate customers to the point where they will do as he requires; to show big assets to the banks when he needs to borrow money, and next to none at all to the tax assessor.

Some things that it may be said more seriously that he must do are to push his organization so that it will complete all the business a busy season demands and push his solicitors so they will produce all the orders he can do during dull times; build up millions of good will, without being forced to inject it into the balance sheet in order to make both ends teeter; build up an organization that will work together as well in his absence as in his presence, but not so well that his men can leave him at night and establish a competitive business the next morning; keep his stockholders well paid, without encouraging them to wrest control away from him;

have everything systematized so that he knows where he stands, and avoid getting into so much red tape as to choke his business to death; keep ahead of last week's, last month's, last year's, and the previous high records of his own business. The contractor can be very sure that his business is not going to run automatically. He has got to use his brains in analyzing his business expenses into its different components. He ought to know his business as well as he knows how to install good wiring. This is one of the surest way to success.

Remote Control of Lamps.

Electricians are frequently called upon to arrange switches in certain rooms of private residences so that lights in other rooms can be turned on or off by means of them regardless of the switches in the rooms where the lamps are located. Where this is the only condition to be fulfilled the task is an easy one; a three-point local switch and another switch of the same kind at the point of remote control is sufficient. Once in a while, however it is required that the arrangement be such that certain lights, or all the lights in the house, can be turned on by means of a switch in some particular room, and that they cannot be turned off with any other switch while this switch is kept closed. Sometimes, for example, the owner of the house may want to be able to flood the rooms with light at will by closing a switch in his bed room, and to keep the light on until he opens this switch again. Several schemes for accomplishing this have been worked out, but some of them require an arrangement of circuits which the average electrician is liable to find confusing. The scheme illustrated in Fig. 1 is interesting for its simplicity.

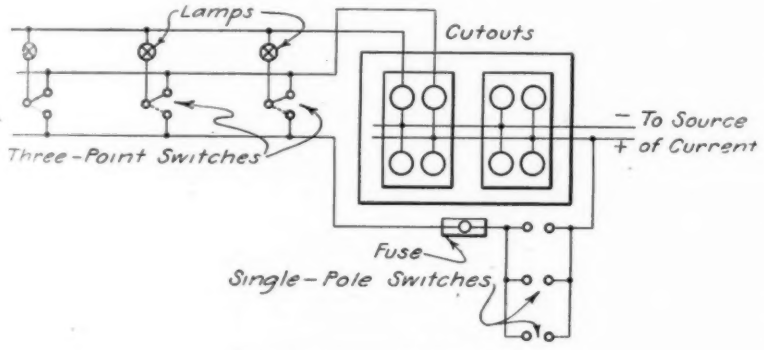


Fig. 1.—Arrangement of Switches.

By reference to the figure it will be observed that the lamps in the outlets shown are controlled locally with three-point switches instead of the usual single-pole switches, and one point of each switch connected to a third wire paralleling the two wires of the lamp circuit. Single-pole switches are connected as shown. There may be as many of these as is desired and they may be located in any places convenient. There could easily be one of these single-pole units in each bed room in the house, for example, so that in case of any emergency, such as a burglar invasion, the occupant of any room could immediately light up the whole house. In the figure the single-pole units are shown close together, to save space.

The three-point switches would usually be of a standard type, and each switch would be located in the room where the lamps it controlled were. When the single-pole master switches were all open the lamps could be turned on and off with the three-point switches. But while a master switch is closed all the lamps will keep burning regardless of whether the three-point units be turned so as to complete the circuit along the heavy or along the dotted lines shown connecting the points of the switches.

To keep from confusing the figure but one lamp circuit is shown, but it is a simple matter to adapt the arrangement to a house having any number of circuits. To make the system as complete as possible keyless lamp sockets of such a type that the lamp can be locked in place may be used.

Defects in Motor Insulation.

According to the *Times Engineering Supplement* (London), a good many motors which are made for factory purposes are installed in situations where, by the nature of the processes involved, they are necessarily subjected to high temperatures combined with a certain amount of humidity in the atmosphere, and similar conditions may arise also in the case of motors which are made for export and which are eventually installed in tropical climates. In such situations a considerable amount of weakness in insulation has been traced to the use of materials of an absorbent character for slot insulation in stators. The use of these materials is perfectly legitimate in ordinary circumstances, but where the motor is to work in the severe conditions mentioned above, a material which is of an absorbent nature is not the best to adopt, and a considerable number of breakdowns will probably be found to have been caused by the use of such materials in such circumstances. In some cases where motors have failed in this way they have been rewound with micanite insulation only, used next to the wire, and the insulation tests have then always been found satisfactory, even after protracted use, whereas with the materials referred to above it has been in some cases impossible to get an ohmmeter reading of any considerable value.

Motor designers are aware that so far as possible wires or bars in the conducting circuit which passes any considerable voltage between them should be kept as far apart as possible; but not infrequently, owing to inadvertence or accident, this precaution is not observed, and frequent breakdowns of windings in rotors and stators have been traced to one section of the windings short-circuiting to another adjacent section which may have been wound over it. This is not always a fault simply of the design, since with ordinary care in manufacture it is possible to insulate so thoroughly that breakdown need not occur, but in some instances the risk caused by the adjacence of different potentials is aggravated by a slight absence of care in the choice and use of materials. In one such instance copper bars were employed for the windings of a large motor, and the sectors connecting one bar to the next bar in the circuit were also made of copper bar. Unfortunately, however, the edges of these sectors were rough. They had not been cut straight, and the precaution of floating them with solder had not been taken. The result of this neglect was that the vibration caused the insulation to rub away, and the bar became short-circuited to an adjacent one. The damage could not be repaired without taking out a considerable portion of the winding, and the engineer in charge of the installation unwisely took the risk of allowing the motor to run. The result was that it became useless, and it therefore became necessary to rewind the rotor completely. When this was being done care was taken to avoid the evils mentioned above, and the spaces between the bars were carefully packed so as to avoid mechanical abrasion. As an additional precaution extra bands were put on the rotor to minimise the effect of vibration, and when this had been done the motor ran again without any further trouble from this cause.

HOUSE-WIRING INSPECTION IN THE SMALL CITIES AND TOWNS.

By Fred R. Lufkin.

The wide adoption by many of the smaller communities of a system of house-wiring inspection is entirely commendable, provided the responsibilities of such inspection are actually assumed in all seriousness. However, if this work is undertaken without proper knowledge of the conditions involved and the house owner is allowed to believe that he has the protection afforded by an up-to-date inspection system without really having it, the results are worse than with no system at all. The responsibility which an owner would otherwise assume is entirely lacking if the inspection system is inefficient because of the employment of men lacking in knowledge and experience.

A man desirous of becoming efficient in such work must spend considerable time in applying the theoretical side to the practical side, and the reverse. A good electrical inspector should not only be able to inspect the work in an intelligent manner but also be able to advise the wiring contractor concerning the layout of the wiring system and the methods of actually doing the work. He should protect the owner and at the same time be a help to the man doing the work. A successful inspector of wiring who has been with a well-known town in Massachusetts for over fifteen years has been able to develop a very practicable system. A few of his ideas may be worth the attention of other inspectors.

Before the electrical work on a building is begun he requires written notice of just what is planned, and, in certain cases, calls for actual wiring layouts. In every case he goes over the work in detail with the contractor, and is often able to suggest changes welcome both to the contractor and owner. He allows no wiring whatever to be done in a building until the carpenters, lathers, steam and gas fitters, and all other workmen who might in any way interfere with the electrical wiring have completed their work up to the wiring installation. This ruling, against which contractors often rebel, has saved considerable expense which would otherwise have been incurred for changes that would have been necessary had the electricians begun their work too soon. When everything is in readiness, the electrician can go ahead with greater expedition than would be possible if he was obliged to allow for certain piping or other equipment yet to be installed. This inspector also calls for due notice of all changes made in wiring previously installed. Complete records of new installations as well as all changes and inspections are kept at his office.

This inspector is an advocate of all modern methods in doing wiring, as well as of using the best materials. He has not yet succeeded in doing away with knob-and-tube installations, although he believes that conduit work is enough better to warrant this. However, in all knob-and-tube work he has made it his duty to see that circuits are laid out to avoid, as far as possible, piping and damp places. Many schemes for crossing pipes, etc., are satisfactory for usual conditions but the avoidance of such dangers altogether is much better. No exposed wiring under bathrooms, sinks, etc., is permitted.

All circuits are tested with a high resistance magneto both at the completion of the wiring itself and after the fixtures are hung. By the additional intermediate test any trouble in the wiring itself is detected and remedied immediately and trouble on the final test can be found and the circuits cleared without having to deface the already completed building to get at the concealed wires.

Frequent inspection trips during the course of the work take but little time and add much to the efficiency of the inspection work. That the wiring contractors have come to appreciate these trips and this inspector's advice is evidence of the atmosphere which he has so successfully created among the men with whom he works.

It is a common error to believe that a house built before the advent of electricity can not be wired without ruining the walls and ceilings.

ARRANGEMENT OF CUTOUT CABINETS.

By E. S. Rowe.

In metering the current in office buildings or in blocks fed from one group of meters it frequently becomes necessary to make changes in the connections in order to accommodate customers who rent two or more sets of offices or rooms and who want all the power they use registered on one meter. When the meter loops are wired directly into each circuit it is a difficult matter to make such changes. But the difficulty may be overcome easily enough by arranging the cutout cabinet and meter boards as shown in Fig. 1, where the connections for one meter are indicated.

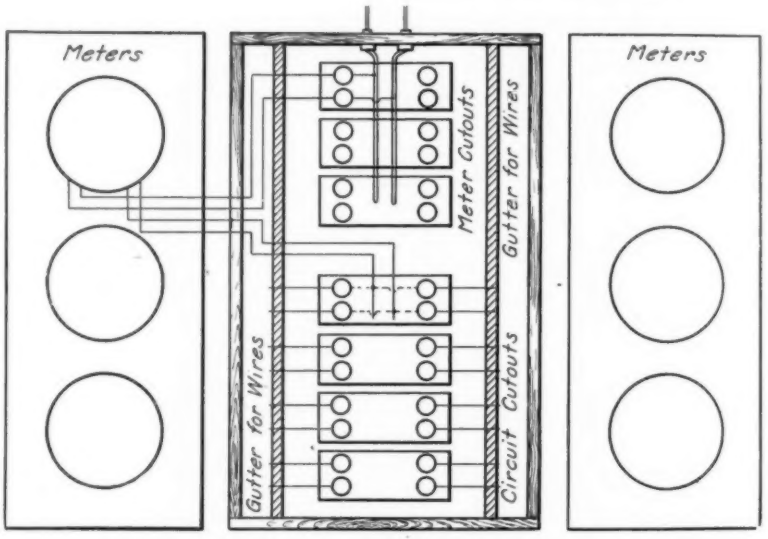


Fig. 1.—Location of Meters and Cutouts.

In this figure the meters are grouped on boards at either side of the cutout cabinet.

It will be seen that the meters are connected to the upper cutouts, and that from the meters wires are run to cutout blocks in the load circuits. With this sort of scheme it is a very simple proposition to add circuits on the load side of the meter when a customer takes on more than one of them.

It is usually advisable that the cutout cabinet have gutters for the wires on either side of the door that can be made accessible by removing the casing, this having been fastened on with screws.

Such an arrangement as the above permits the wires to be changed around in any way that may become necessary, without the electrician having to look up any records made when the meters were installed. It is a simple way of keeping the wires in an orderly arrangement.

LETTER TO THE EDTIOR.

Keeping Concrete Out of the Conduit.

To the Editor:

I noted with interest the editorial on how to keep water and cement out of the conduits in concrete buildings which appeared in your issue of March 29, and also the comments in subsequent issues which it called forth.

In work of the kind referred to I have been using the knockout plugs in the open ends of the conduits. I put the plug in the bushing and then screw this on tightly.

This scheme, I find, works well on half-inch and three-quarter-inch conduits. For larger sizes, I would suggest that a common star bushing could be made with a closed end, without difficulty or excessive expense, it would seem. A bushing of this kind could be left on until the wires were to be pulled in, and then it could be removed and a standard type of bushing put in its place. This would keep foreign matter out of the pipes, and I do not think it would materially increase the cost of the job.

F. HUSAR.

Chicago, Ill., April 30, 1913.

Movement to Require Registration of Electricians in Chicago.

There is now pending in the City Council of Chicago an amendment to one of the electrical ordinances of the city which, if it is passed by that body, will make it necessary for persons engaged in electrical work in the city to be registered as electricians with the municipal Department of Electricity. The proposed amendment is as follows:

"All persons, or corporations, desiring to install wires or other apparatus for the use of electric currents for any of the purposes (light, heat or power) mentioned in the foregoing section shall, before commencing or doing any electrical work of any kind whatever, either installing new electrical apparatus or repairing apparatus already in use, file an application for a permit therefor in the office of the City Electrician, which application shall describe in detail such material and apparatus as it is desired to use, with a full description of the same, giving the locality by street and number, and be countersigned by the person under whose supervision the work is to be done; and upon the receipt of which application, if found proper, such permit shall be given. The applicant must file with the City Electrician an affidavit stating that such work will be done under the supervision of a person who is not less than twenty-one (21) years of age, who has a thorough knowledge of electrical construction and who has had not less than four (4) years' practical experience in the installing of electrical wires and apparatus for the purpose mentioned in the foregoing section. Such affidavit must contain the name and signature of the person under whose supervision the work is to be done, together with two indorsements from reliable citizens, made under oath, that such person possesses the qualifications above mentioned. Upon the receipt of such affidavit if found proper, and upon the payment of a fee of one hundred dollars ($100) to the City Collector, the City Electrician shall issue a Certificate of Registration to such applicant, which shall entitle him to obtain permits to install electrical wires and apparatus as aforesaid for a period of one year."

A proposition somewhat of this kind was before the Council about a year ago. It is said that the opposition on the part of local electrical workers' organizations was the cause of its defeat. The above amendment appears to have the support of these, and that of the other interests which would be most affected by its adoption.

State Branch of National Electrical Contractors' Association Organized in Kansas.

The members of The National Electrical Contractors' Association met in Topeka, Kans., at the Commercial Club rooms on May 3, and organized a Kansas state branch of the National association. The firms represented were the Bushong Electric Company, Ottawa; the Meeks Electric Company, Kansas City; the N. C. Picard Electric Company, Kansas City; Graeber Brothers, Lawrence; Tholen Brothers, Leavenworth; Staley & Fees, Wichita; Mears Brothers, Arkansas City; the Woodhouse-Stein-Francis Electric Company, Atchison; O. J. Comer, Hutchinson; the E. L. Overton Engineering Company, Topeka; the Tucker Electric Company, Topeka; E. P. Jordan, Topeka; the H. B. Howard Electric Company, Topeka; and the Machinists Electric Company, Topeka.

The officers elected were: E. L. Staley, president; I. C. Bushong, vice president; J. R. Woodhouse, treasurer; and J. A. Mercer, secretary.

In the evening a lunch and smoker was given at the Throop Hotel.

Chicago to Have Assistant City Electrician.

There will be an examination in Chicago on May 13 for the purpose of selecting suitable applicants for the position of Assistant City Electrician. The examination will include mathematics, experience, making out reports, and some special subject to be selected by the examining board. The Assistant City Electrician will have authority to sign documents for the City Electrician, and will assist in the management of the office of the Department of Electricity. He will act as City Electrician in the absence of that official. The salary will be $4,000 per year.

Among the Contractors.

O. E. Tucker, a leading electrical contractor of Mexico, Mo., has just completed the electrical work in the new home of the Elks Club in Mexico, and that in the new Adrian County Infirmary. Mr. Tucker has just been awarded the contract, also, for the electrical work in the post-office building now under course of construction in his town, the cost of which job will approximate $4,000.

T. J. Gorman, one of the best known electricians in Fargo, N. D., has started in business for himself at 720 Front Street, and will carry on a general electrical contracting business. "Tom," as his friends know him, is a progressive chap, and ought to be successful in his new venture.

Ralph T. Sayre, of East Liverpool, O., has the contract to install the electric wiring in the new building of the East Liverpool High School. This contractor is also doing the electrical work in the new public-school building at Newell, W. Va.

E. A. Emery, of Galva, Ill., the present superintendent of the local electric lighting plant, will open an electrical construction and supply business in that town on June 1. Mr. Emery has already secured the contract for the installation of the electrical work in the new Henry County Infirmary, at Cambridge, Ill.

The Blumenthal-Kahn Electric Company has been awarded the contract for the electrical installation in the new six-story concrete warehouse building for the J. Henry Miller Company to be built at Eutaw and Franklin Streets, Baltimore, Md. Loricated conduit and slate panelboards will be used throughout.

The Charles G. Bosch Company, of Burlington, Iowa, has opened an electrical contracting business at 317 North Main Street, that city. J. M. Redmon, who will have charge of the construction work the company undertakes, is one of the best known electricians in his section of the country.

The Risinger Manufacturing Company, of East Liverpool, O., is installing the electric wiring in the new Young Men's Christian Association building in that town.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Convenient Soldering Ladle.

In the issue of April 26 there appeared a description of a cup for solder made by twisting a piece of wire around a gas cap. I know from experience that a cup or ladle of this kind is very useful in certain jobs of soldering the inside wireman has to do, but I find it best to make the ladle out of a *BX* (or steel-armored

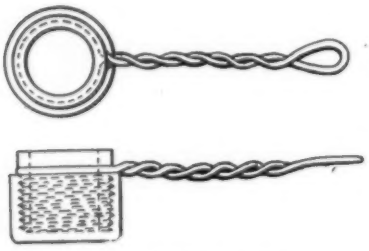


Fig. 1.—Soldering Cup.

cable) straight bushing, a half-inch gas cap and a piece of iron wire. Take the *BX* bushing and knock off the flange or bolt end, and then screw the threaded part into the gas cap. Finally, wrap the iron wire around between the portion of the bushing above the last thread and the upper edge of the gas cap, and twist the two free ends of the wire together to form a handle for the ladle.

J. B. Wathier.

Plan for Trimming Arc Lamps on High Ceilings.

I was called upon sometime ago to hang several arc lamps from a very high ceiling of an audience room. As these were 100-hour lamps, I had to devise some method by which they could be conveniently trimmed. I accomplished my purpose in this way. I made a small windlass for each lamp and located it permanently in the attic directly above the lamp. I made the drum 24 inches long and six inches in diameter, and divided this into three equal sections by the use of a wooden collar two inches deep which I fitted clear around the drum and nailed fast. I suspended the lamp with window cord, lowered it the proper height from the floor, and then fastened the upper end on the middle section of the drum. I then selected feed wires with thick insulation to get them as nearly the size of the rope as possible in order to have them all feed alike on the drum. I lowered the feed wires from the attic, had them fastened to the lamp terminals, and drew them up to the same tension as the rope. Finally, I fastended these feed wires one to each end of the drum, leaving a foot of the ends loose, where I used removable connectors for the wires. These are to be disconnected while raising and lowering the lamps.

W. A. Hines.

Meter Installation.

The writer was once obliged to install two single-phase meters on a two-phase motor circuit, and he found that the meters had to be installed in what was known as the "motor-house." This house, or shelter, was attached to a large brick-making machine which was driven by the motor. When the brick machine was in operation the motor-house vibrated violently, making it almost impossible to install the meters on the side walls.

It was found to be impracticable, moreover, to install the meters on the pole from which the service-wires dropped. So the scheme illustrated in Fig. 5 was worked out. The meters were accurately spaced on the hardwood board, one on one side of the board and one on the other, so that one meter balanced the other, and the board was suspended from the ceiling by two close-wound springs. The leads were of flexible wire so that they did not bear down or pull away from the meters, consequently the meters hung practically motionless. The installation has proved entirely satisfactory.

The reader should understand that, although that fact is not made clear in Fig. 3, the two meters shown are on opposite sides of the board, one on the back and the other on the front.

A. P. Broadhead.

Setting Switch Boxes.

In conduit work it is not always that the switch box is left flush with the surface of the finished wall. It is often the case, in fact, that when the electrician comes to set the switches, he finds the front edge of the box from half an inch to an inch back of the wall line, and he must devise some plan for bringing the switch out flush so that the plate can be fastened with the screws that came

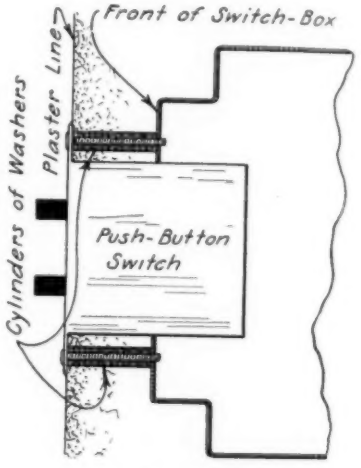


Fig. 3.—Box in Position.

with it. Where this has to be done in close places, it is a good plan to use a longer machine screw and washers enough to build out the switch to the desired place. The washers can be built into one-inch columns by wrapping a piece of tape around a one-inch pile of them. This keeps the washers from falling off the screws.

Morris Morriarty.

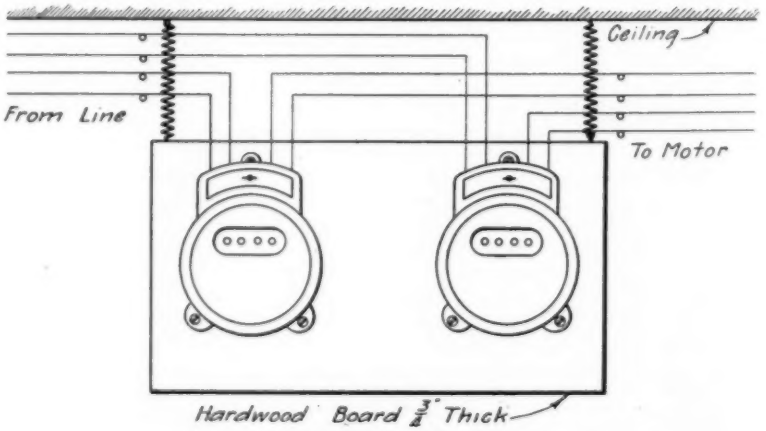


Fig. 2.—Meter Board on Ceiling.

Among the Supply Men

The Electric Traction Supply Company, St. Louis, Mo., is conducting a special sales campaign on Berg folding fenders for street cars. The company has many records where these fenders have picked persons without the slightest injury, and they are being adopted by a large number of prominent street railway companies.

The Avery-Loeb Electric Company, Columbus, Ohio, reports unusual demands for pole-line material from the valley districts to restore equipment washed away by the floods. Harry D. Rei, formerly city salesman of the company, has resigned and accepted a position with C. M. Crofoot, representing the Crouse-Hinds Company, of Syracuse, in the middle west with headquarters at Cincinnati. Oscar Avery says that Harry Rei is a Jovian and a booster, and deserves every success.

The April issue of *Electron*, the newsy little monthly published by the Central Electric Company, Chicago, has a striking frontispiece illustrating the illuminating power of Alexalite indirect fixtures for the lighting of the second floor of the Glass Block in Duluth. There is also an interesting article on factory illumination and an appreciation of Charles E. Brown, secretary of the Central Electric Company. S. E. Kennedy, assistant treasurer of the company, is the author of an article entitled "Essentials for Success." Those who are familiar with Mr. Kennedy and know his hard-headed practical methods of arriving at results, will appreciate this contribution.

A number of prominent supply men engaged in a Dutch treat and golf party at the South Shore Country Club, Chicago, on Tuesday, April 15. It is understood that "Billy" Low carried off the honors, making the difficult nine-hole course in 45. This is an improvement of about 100 per cent, as the week previous the gentleman had won four golf balls from a prominent electrical man by making the nine in something like 65. Among those in the party were Mr. Low, president Electric Appliance Company; N. G. Harvey, of the Illinois Electric Company; W. H. Colman, Chicago manager of the General Electric Company; Henry Andrae, of Julius Andrae & Sons Company, Milwaukee; M. B. Austin and W. Brown, of M. B. Austin & Company; and T. C. Ringgold of the Central Electric Company.

F. H. Stanford, of the Nunn Electric Company, Amarillo, Tex., states that the company recently separated the retail business formerly carried, and increased its office force and strengthened the sales organization in order to take care of its rapidly growing business in Oklahoma, Texas and New Mexico.

F. W. Buck, chief clerk of the Union Electric Company, Pittsburgh, Pa., announces that the company has been appointed agent for Sherwin-Williams insulating paints and varnishes, and is carrying a complete stock in Pittsburgh. The company is going to put on an active selling campaign for these specialties. This is a well known line, made by the Sherwin-Williams Company of Cleveland, whose products bear a worldwide reputation. George A. Schardt, who was recently made assistant sales manager, has left the company to become associated with Hart & Hegeman Manufacturing Company, Hartford, Conn. W. C. Jones has been appointed sales manager.

W. R. Herstein, secretary and treasurer of the Electric Supply Company, Memphis, Tenn., has just returned from the annual convention of the Mississippi Section of the National Electric Light Association, which held its meeting at Vicksburg on April 21. The company reports an unusual local demand for electrical cooking devices on account of the breaking of the levee protecting the gas works, and the temporary cecession of the gas supply. There was also an unusual demand for dry batteries to operate motor boats in the flooded district. Weatherproof wire and temporary sockets and other emergency material for lighting the river fronts in central-station towns where the levees are still patroled day and night have brought an unusual demand for material of this nature. The company is also very busy renewing lamp contracts, many of which expire in April and May.

Frank Zencak, manager of the switchboard department of the Elliott-Lewis Electrical Company, Philadelphia, has just returned from a successful trip into new southern territory.

On Saturday, April 19, the directors of the Manhattan Electrical Supply Company of New York, held a special meeting to fill the vacancy in the office of president, caused by the death of H. T. Johnson. At this meeting J. J. Gorman was elected president and B. H. Ellis treasurer and vice-president. Messrs. Whitmore, Pierce and Manger will continue in the offices held by them so long.

H. J. Gorke, Syracuse, N. Y., reports very briefly that business is mighty good.

I. E. Greene, manager of the H. C. Roberts Electric Supply Company, Syracuse, N. Y., says that the company is enjoying a large business in pole-line construction material. The company is carrying in stock fir cross-arms and the customers are very much pleased with this material, notwithstanding high prices. Business seems to be coming in equally good proportions from all quarters. Mazda lamp business is growing particularly strong, the company having doubled its sales on Colonial Mazda lamps in the past year.

B. K. Wheeler, manager of the C. D. Wood Electric Company, New York, reports that C. D. Wood is returning from an extended trip through Holland, France, Germany and Austria, where he has been purchasing flashlights and electric lamps for the American market. He is bringing home several novelties which have never been seen before in the electrical trade in this country. Mr. Wheeler will start in May on an extended trip through the West.

R. W. Winfree, Jr., general manager of Robinson, Nelson & Company, Richmond, Va., reports that the company has closed a very successful campaign on telephones and accessories and on heating devices. There has been such a general increase in business that it has been necessary to engage three more employees. Good business is reported

from North and South Carolina on general house-wiring devices and the material enumerated above.

The Frank H. Stewart Electric Company, Philadelphia, Pa., has published a very interesting little volume entitled "Our New Home and Old Times." It will be remembered that the new home of the company is located on the site of the old Mint Building at Philadelphia. The building is "L" shaped, and occupies three city lots on North Seventh Street and Filbert Street. The historical feature of the site is perpetuated by bronze tablets and the name of the building. Conspicuous among the features harking back to the old days is a bench made of oak timbers of the coinage building, which was presented to Mr. Stewart on Christmas day, 1911. There are also chairs of antique design made from the old coinage building. The book is replete with photographs of the various departments and with interesting information regarding the site and electrical conditions particularly relating to the supply business of the early days.

A. M. Little of the Mohawk Electrical Supply Company, Syracuse, N. Y., states that his company is conducting special sales campaigns on fir cross-arms and electric fans. Central stations in the eastern states are beginning to see the wisdom and advantage of using high-grade material, especially cross-arms and pole-line materials. Mr. Little says that business has shown a very satisfactory increase during the first four months of the present year, and they have been compelled to add another salesman to their sales force.

Public Service Commissions

CALIFORNIA.

The California Railroad Commission has decided the case of the Oro Electric Corporation which applied for a certificate permitting it to serve the city of Stockton and vicinity in competition with the Western States Gas & Electric Company, already serving the field. The decision is distinctly against the theory of competition in public utilities and the Western States Company is protected, providing it complies with certain minor conditions imposed by the Commission. The Western States Company had been engaged in the work of unifying and rehabilitating the local gas and electric systems which had suffered from competition in the past. Betterments were nearly completed when the Oro Corporation attempted to enter the field.

Permission was given to the Oro Electric Corporation to serve a portion of San Joaquin County, but authority to enter and compete in the city of Stockton was withheld.

During the period from March 24 to April 30, the Railroad Commission rendered decisions granting the following stock and bond applications:

Los Gatos Telephone Company to issue $15,000 of stock.

Los Angeles Gas & Electric Company to issue $900,000 of bonds.

Mt. Whitney Power & Electric Company to issue $250,000 of bonds.

The Tujunga Water & Power Company was denied authority to issue $300,000 of bonds.

GEORGIA.

The Railroad Commission has issued its report for the year 1912. Statements are given regarding 48 public-utility companies, including street railways and central stations.

INDIANA.

The members of the Public Service Commission of Indiana have been appointed as follows: Thomas Duncan, chairman; James L. Clark, Charles J. Murphy, John F. McClure and Frank E. Payne. The two last named were members of the former Railroad Commission.

MARYLAND.

The Public Service Commission has given its consent to the formation of the Annapolis Public Utilities Company, with an authorized capital stock of $300,000 and practical ownership by the Baltimore, Washington and Annapolis Railroad Company. The new company takes over the Annapolis Gas and Electric Light Company and the railroad agrees to purchase 2,027 shares of the Public Utilities Company's stock at par. The total issue is 3,000 shares.

NEW JERSEY.

The Board of Public Utility Commissioners has refused to approve of a bond issue of $25,000 first-mortgage bonds by the Independent Telephone Company of Burlington County; and has made the following ruling upon a suggestion tendered in behalf of the company that the Commission in granting approval of the issue might attach a provision that the bonds should be guaranteed as to interest and principal, by a fully responsible party satisfactory to the Board.

"This proposal, if accepted as a practice by the Board, might readily involve grave difficulties in passing upon the credit of proposed guarantors of security issues. If the guarantor were another public utility, the question might arise whether such a guarantee is not ultra vires, and if not, whether it in any wise imposes a burden, actual or potential, upon the the consumers or rate payers of such other public utility. In certain cases, where one public utility leases the property of another, such a guarantee taking the form of a fixed rental might be eminently proper; but in view of the embarrassment that would ensue upon the adoption of a policy of this kind, where the Board has no knowledge of the relationship between the guarantor and the company, the offer in this case and in similar cases must be declined."

NEW YORK.

The New York Railways Company has applied to the Public Service Commission, First District for permission to substitute storage-battery cars for horse cars on the Metropolitan Crosstown Line running from Delancy Street and the Bowery through Spring Street, West Broadway and other streets to the Desbrosses Street ferry on the Hudson River, in New York City.

The Commission has issued an order requiring all public-service corporations using high-tension electric apparatus to adopt certain safety appliances and to take certain precautionary measures to protect their employees against injury by contact with electrically charged conductors. The order covers 28 different points.

The Commission has granted the

Bronx Gas and Electric Company permission to issue $200,000 in bonds for the acquisition of property and improvements of its plant. The bonds are to run until July 1, 1960, bear 5 per cent interest, and be redeemable after July 1, 1920 at 105 and accrued interest. The company is allowed $10,000 of the amount to cover expenses of sale, etc., but must amortize it by paying $960 a year into a sinking fund until the required amount has been accumulated.

The Belt Line Railway Corporation has been granted permission to change its motive power from horses to storage batteries.

The Public Service Commission, Second District, has authorized the Seely Electric Company to issue $12,300 of the par value of its capital stock, to be sold at not less than par; proceeds to be used for the purchase of the plant, machinery, lines, rights of way, etc., of the S. Alfred Seely Estate of Spencer, N. Y.

The Commission has ordered a reduction in the price of electricity charged by the Suffolk Light, Heat & Power Company in Southampton from its present rate of 25 cents per kilowatt-hour to summer residents taking service confined to the summer months, so that the rate shall not exceed 22 cents per kilowatt-hour with a discount of 10 per cent from the amount of all bills paid within ten days. After the expiration of two years the rate is to be 20 cents with a discount of 10 per cent.

The Commission has been notified by the New York Telephone Company that it has purchased the property and business of the Phelps Home Telephone Company for the sum of $15,200, and the Seneca County Home Telephone Company, operating at Seneca Falls, N. Y., for the sum of $84,000.

The Commission has authorized the Schenectady Illuminating Company to issue its common capital stock to the total par value of $2,000,000. The proceeds are to be used for the purposes of paying a note issued for proper capital purposes.

The Commission has authorized the Rockland Electric Company to exercise franchises for the furnishing of electricity in Suffern and Hillburn, Rockland County.

NORTH CAROLINA.

The Corporation Commission has, by an act recently passed, been given supervision over electric light companies in North Carolina. Authority is given the Commission to regulate rates and service and to prevent discrimination.

OHIO.

The Public Service Commission has authorized the Ohio Electric Railway Company to issue its five-per-cent second-mortgage bonds in the amount of $3,500,000 par value on the condition that the common stock of the company amounting to $5,000,000 be retired.

The Defiance Gas & Electric Company has been authorized to issue its common stock to the par value of $57,000 and first-mortgage five-per-cent bonds to the amount of $257,000. Bonds to the amount of $200,000 are to be used in exchange for a similar amount of bonds now outstanding.

Before final adjournment the Ohio Legislature passed the amended public utility bill, providing for a new commission and for a valuation of all public service corporations of the state, the bill giving public utility corporations the right to surrender their limited-term franchises and accept indeterminate grants from municipalities, with a right of purchase.

OKLAHOMA.

The Oklahoma Corporation Commission has dismissed the case of George A. Davenport et al., of Soper, Okla., against the Pioneer Telephone and Telegraph Company, charging that the defendant company would not make physical connections with the Choctaw Telephone Company. It was pointed out by the Pioneer Company at a hearing of the case that connections were made by it through another company, the Citizens' Telephone Company of Soper, and the Commission held that inasmuch as the Citizens' Company was not made a party to the suit it could take no action.

The Corporation Commission has ordered the Chandler Electric Company to provide electric current for A. M. Irion, proprietor of a moving-picture theater at Chandler, Okla. Irion stated in his complaint that he had established a generator of his own, which usually supplied the electric current for his theater but that when his machine broke down the company refused to supply him except at a minimum rate of $5 per month. The Commission held that it would not pay the company to supply such current only when there was a breakdown and directed the company to install a meter in the theater, fixing the minimum at $3 per month, the charges to be regulated by the meter when they go above that amount.

WISCONSIN.

The Railroad Commission has issued notice of a hearing to take testimony on the valuation of the Brodhead Electric Light and Power Company. The city of Brodhead having voted to purchase the property under the provisions of the public utility law, it is necessary for the Commission to determine upon the price to be paid and the conditions of transfer.

As a result of an investigation of the service rendered by the Bayfield municipal water and light plant, the Commission has ordered the Board of Water and Light Commissioners of Bayfield to take immediate steps toward a complete rehabilitation of the plant and equipment. The Commission was of the opinion that the present poor and inadequate service could not be improved materially with the obsolete equipment now in use and that it would be necessary to replace all such apparatus with modern machines before satisfactory service could be given.

The Muscodo Mutual Telephone Company has been ordered to abolish its present practice of distinguishing between stockholders and non-stockholders in the matter of rates and to substitute therefor a uniform schedule of charges as prescribed by the Commission. A switching fee of $3.00 per phone affected was granted. All free service is to be discontinued and an annual rental fee paid by the utility to all subscribers owning their own equipment.

The Antigo Telephone Company has been authorized to issue $15,000 of six-per-cent bonds for the purpose of making extensions to the plant.

The Oakfield Light and Power Company has been empowered to issue $10,000 of stock, the larger part of which is to replace stock which was not issued in accordance with the provisions of the stock and bond law.

INTERSTATE COMMERCE COMMISSION.

The Interstate Commerce Commission has appointed a Board of Engineers to inaugurate plans under which the valuation of the railroads of the country will be carried out. The chairman of the Board is R. A. Thompson, now in the service of the California State Commission and formerly with the Texas State Commission. The other four members of the Board are W. D. Pence, formerly chief engineer of the Wisconsin Railroad Commission; J. S. Wormley, a consulting engineer of Kansas City; Howard M. Jones, a bridge engineer of Nashville, Tenn., and E. F. Wendt, chief engineer of the Pittsburgh & Lake Erie Railroad and president of the American Society of Civil Engineers. The Commission is desirous of having President Wilson assign also to this board an engineer from the army.

Thirty Years Ago.

Electrical News of 1883 as Presented in the "Electrical Review," the Pioneer Electrical Weekly of the United States—Eighth Installment.

(From "Electrical Review," New York, May 10, 1883.)

The State Department at Harrisburg, Pa., has granted a charter to the Delaware and Atlantic Telegraph and Telephone Company, with a capital of $10,000.

The Lighthouse Board will purchase a first-order lens for an electric light, and will institute a series of experiments with a view of determining the value of the various kinds of electric light for lighthouse purposes. A first-class lighthouse will be built at Mosquito Inlet, Fla., and third-class lighthouses at Sanibel Island and Cape San Blas, Fla.

SLIGHTLY CRITICAL.—It is one of the marvels of the hour that the Washington Gas Light Company should insist upon selling as gas a product that would bring so much more money if made into dark lanterns, car springs, black paint, coal hods, waterproof coats, and ink. Had it been devoted to these uses, today's divide of surplus might have been twice as large.—*National Republican.*

The Hartford Electric Light Company has submitted to the city authorities a plan to light the entire city, and the proposition, in official form, will be laid before the council at its meeting two weeks hence. The company proposes to furnish the lights every night in the year, moonlight or dark, and that they shall be kept burning all night. The figure named for the service is $38,000 per annum.

The electricity generated by the machinery in one of the great Harmony Mills at Cohoes, owing to peculiar conditions which are not perfectly understood, has of late so charged the atmosphere as to affect the employees unpleasantly. Various attempts were made without result to remove the nuisance, but at last a network of wires running through the mill has been successfully employed to collect the electricity and conduct it to the ground.

The Laredo *Times,* announcing the arrival in that city of J. J. Ghegan, general manager of the Compania Telegrafica-Telefonica Mexicana del Norte, with headquarters at Saltillo, says that Mr. Ghegan established telephone communication, by means of the Mexican government wires, between New Laredo and Monterey, a distance of 225 miles, and a very satisfactory experiment was made in its use, notwithstanding the long distance and impromptu arrangements.

LONDON, April 30, 1883.—A complimentary banquet was given tonight to Norvin Green, president of the Western Union Telegraph Company, by John Pender, M. P., at the Ship Hotel, Greenwich. Mr. Pender said: "The position of Dr. Green is one of the most arduous and responsible in America. Dr. Green presides over a company with $80,000,000 of capital, 13,000 stations and 20,000 employees. The company owns 400,000 miles of poles and 425,000 miles of wire. In 1866 there were 75,000 miles of wire and 2,250 employees. The profits were over $2,500,000; they are now $8,000,000."

The choice of routes of a Pacific cable is an important question that has never been satisfactorily settled. A line from Alaska to Japan would be much shorter than any other. Unless recent advances have entirely removed former obstacles, a direct line from San Francisco to Yokohama or Japan, without intermediate landing place, could not be worked with profit. As to any obstacles that might arise from carrying the line into such a high latitude as Sitka, we judge that they can not be serious, since only a few years ago it was proposed on good scientific authority to construct a line from Europe to the United States, via Iceland and Greenland, in order to avoid the difficulties encountered in direct connection across the Atlantic. Some of the Australian colonies had enterprise enough to offer subsidies for the laying of duplicate cables on several routes; but as subsidy is a tabooed word in the United States, we can only trust it will be made apparent that the enterprise would be sufficiently profitable without government aid.

Quite recently M. Deprez, in Paris, transmitted large amounts of electrical power to distances of 10 and 20 miles, with a loss, as claimed by him, of 32 per cent while *in transitu.* The fact itself could not be denied, for the experiments had been made in public. The English prints, both scientific and popular, attacked by M. Deprez with great bitterness. It was said that he had greatly over-estimated his results. Happily. Prof. C. W. Siemens, than whom a more intelligent and conscientious electrician may not be found in the whole range of the scientific brotherhood, had attended the experiments and carefully examined the data on the spot. Professor Siemens has, in great measure, corroborated the accuracy of the report of these experiments. When power is collected from running streams or water falls, the loss of 50, 60 or even 70 per cent while *in transitu* would be of little consequence, and the 32 per cent delivered at a distance of 10, 20, 30 or 40 miles, over an ordinary iron wire, as in Deprez's system, could be made to run shafting and to perform other valuable work.

From T. D. L.: The telephone is of man's invention, and that on the whole it is a useful invention is manifest; and is proved by the fact that over 250,000 are now in use in the United States. Instead of hanging up their telephones when they finish talking, and giving no sign, a large majority of subscribers now, as soon as they finish and hang up their telephone, send in a short ring, which drops the central office annunciator and notifies the operator to straighten the lines. If all subscribers would do this the "hello" nuisance would as by magic cease. If those who daily use the telephone had, in the early days of the telegraph, been brought into equally intimate contact with it, they would be more patient. But, unlike the telegraph—which has, for its practical operation, always been in the hands of specialists and experts—the telephone has, from its inception, been in the hands of the public itself, and has, perhaps, proved to be the most efficient popular lecturer on electrical science that has ever approached the subject. Therefore, on this account, if no other, let us possess our souls in patience, and he that is without imperfection among us, let him be the first to throw impatient words at the telephone operator.

By G. L. W.: The city of Mexico, considered telephonically, is rapidly increasing in importance. Its numerous government offices, its surrounding haciendas, the custom of its business people of remaining at home during the hours from twelve noon to three P. M., its growing suburban districts, and the use of the telephone by ladies at their homes who rarely are seen on the streets, all tend to this increase. The Mexican Telephone Company has recently been granted a new nine years' additional concession or permit extending its rights in relation to

pole lines, and the work progresses very favorably.

I heard today of a novelty in ground wires. The manager of the exchange at Guanajuato discovered it attached to a large stone on a hilltop and at some distance from the instrument, and complained. But the culprit explained that when the wire was run—in the rainy season—the hilltop was the bed of a river. Fact.

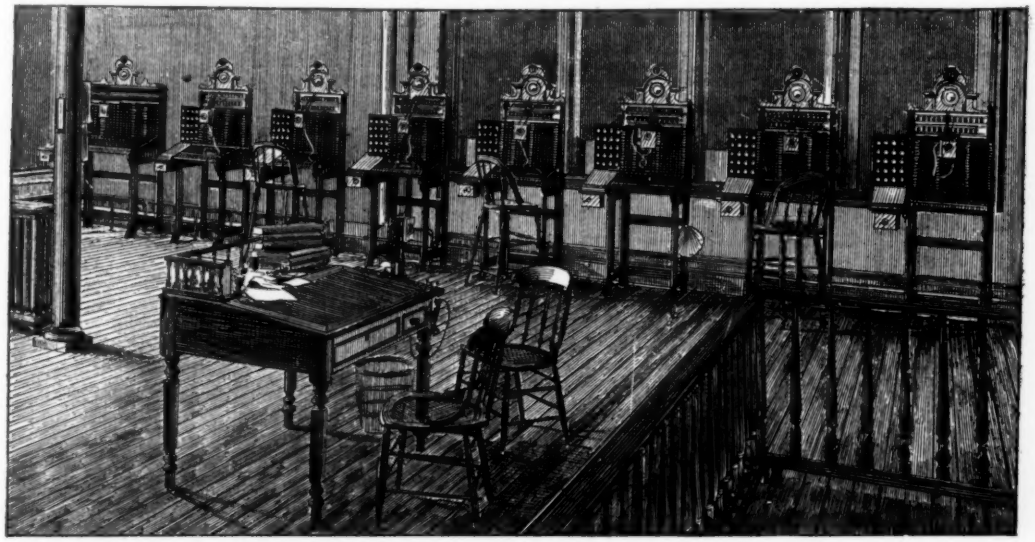
Harry Gorham, at Leon, reports that he followed up a string leading from the office end of an acoustic telephone line, and found it neatly and carefully grounded on a copper plate in a deep well. They told him it was to protect the telephone from lightning! A lightning rod in Lagos runs half-way down toward the water in a well. It is kept carefully away from the sides of the well, and protected at the top by a shed built over the well for that purpose. The electrician who did it said he feared the wire might get wet and rusty. Electric light contracts pending or just executed for ten towers and the general lighting of the city of Mexico will, when carried out, make this city one of the most electrically lighted cities in the world. The Brush light is used.

The Edison incandescent light has just been put in the residence of General Pacheco, Minister of Public Works. The house of ex-President Diaz will next be lighted by this system, for the introduction of which in Mexico a strong company has been organized.

THE PROVIDENCE TELEPHONE EXCHANGE.—The operating room of the Providence Telephone Exchange, one side of which we illustrate herewith, we have thought it important and interesting to our readers to illustrate. The number of telephones rented April 1, 1883, in all of the company's exchanges was 2,480, and in Providence, 1,725. The increase of the present year bids fair to continue at the rate of about 100 per month. The principal office is in Providence City. The operating room of the Providence main office was enlarged and refitted in the summer of 1881, and an entirely novel system of making connections between the switchboards adopted, the peculiar features of which are throwing a portion of the work upon the subscribers by, in most cases, obliging them to give their order twice, doing away with all communication between operators or the necessity of message boys around the room; which system has worked very satisfactorily, as may be judged from the fact that it has not been found necessary to modify it in any way with an increase of the number of subscribers from nine hundred, the number at the time the system was adopted, to about seventeen hundred, in the same room, which is the number the present day. One important peculiarity is that the central-office telephones are invariably looped into the lines under all circumstances, so that no interference is given to the parties conversing if the central office connects into the circuit for any purpose whatever. In the rapid increase of long-distance telephoning, this is a very essential feature, and one which will undoubtedly be found indispensable in every large telephone exchange.

Young ladies are employed in the operating rooms, which are provided with many novelties contributing to the comfort of the operators, and speed in making connections from switch to switch. A retiring room, to be used during meal hours, etc., leads from the operating room of the main office, which is furnished elegantly, and adorned with fine pictures and flowers.

We attribute the great success attained by this company to the energetic and able management of its general superintendent, Mr. Duxbury, and his assistants, Messrs. Gardiner and White, well known as old-time telegraphers and electricians. The officers of the company and board of directors we give herewith: Hon. Henry Howard, president; Henry C. Cranston, vice-president; Charles T. Howard, secretary and treasurer; J. W. Duxbury, general superintendent; F. H. Gardiner, A. C. White, assistant superintendents; Henry Howard, Henry G. Russel, Henry C. Cranston, R. G. Hazard, 2d, Charles Bradley, R. M. Larned, James H. Chace, H. F. Barrows, C. R. Greene, William H. Pope, directors.



"Thirty Years Ago"—Providence (R. I.) Telephone Exchange in 1883—View of One Side.—The Providence Company Had 2 480 Subscribers at That Time; Today It Has 44,000.

Some Electrical Patents of Thirty Years Ago.

April 10, 1883:

Adjustable support for telephonic transmitters, William H. Eckert, John A. Seely and Edward A. Eckert, Cincinnati, O.

Connection for electric light fixtures, flexible electrical conductor, Sigmund Bergman, New York, N. Y.

Dynamo electric machine, Charles J. Van Depoele, Chicago, Ill.

Electric cable, insulating compound for electric conductors, mold for insulating subterranean electric cables, Sidney F. Shelbourne, New York, N. Y.

Headgear for switchmen's telephones, Charles E. Scribner, Chicago, Ill.

Incandescing electric lamp, Thomas A. Edison, Menlo Park, N. J.

Machine for manufacturing electric lamps, William J. Philips and George L. Kitson, Philadelphia.

(Quotations from* ELECTRICAL REVIEW *of May 17, 1883, will appear next week.)

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 138.—Electric Fly and Rat Traps.—Can a voltage less than 110 be used successfully in electric fly traps? What is the best voltage for electrocuting rats and mice?—M. A., Johnstown, Pa.

No. 140.—Electrical Equipment of Gasoline Automobiles.—Which type of electrical equipment is better for gasoline automobiles, to have the electric starting, lighting and ignition combined in one system, or to have a separate outfit for each purpose? What are the advantages of each plan?—C. B. W., St. Joseph, Mich.

No. 142.—Allowance for Reduced Maximum Demand in Summer.—Recently I read an article explaining a rate system used by a British central station in which the number of hours charged for at the primary rate was less in summer than in winter, so as to compensate for the reduced maximum demand and decreased lighting load in summer and to encourage the use of electricity for cooking. Is this system in use anywhere in this country?—F. D., Racine, Wis.

No. 143.—Wide Speed Variation of Motor.—Can a simple controller or control system be obtained for a 220-volt 20-horsepower direct-current motor that is required to run for hours at a time at any one of about 12 equally spaced speeds between 250 and 1,800 revolutions per minute? At the lowest of these speeds the load is only four horsepower and at the highest about 25 horsepower.—S. C. C., Richmond, Va.

Answers.

No. 134.—Changing Meters to Lower Frequency.—I would like to find out from some of your readers who have had experience how to change meters from 133 cycles, 110 volts to 60 cycles, 110 volts. I have a job of this kind in prospect. Can motors be changed in the same manner?—W. T. G., Augusta, Ill.

In regard to the answer to No. 134, published in the April 26 issue of the Review, I think the gentleman from Blandinsville is mistaken in regard to Westinghouse type C meters. In changing these from 133 to 60 cycles, it is not necessary to take the element from the case. The screws holding the copper short-circuiting strip are found just under the disk and inside the magnets, one on each side. The one on the right has a fiber washer under the copper strip and also one under the screw head. Take out these fiber washers and clamp the copper strip down on casting. After changing to 60 cycles any make or type of meter, it should be readjusted, using a reliable standard watt-hour meter.—W. T. G., Augusta, Ill.

No. 136.—Heating Devices and Pull Sockets.—Is it considered safe to connect heating devices taking about 550 watts to pull-switch lighting sockets? I have found in a number of cases where flatirons were used on what seemed to be well constructed pull sockets that after several months' use the contacts would suddenly become fused and the switch could not be pulled on or off.—G. H. T., Adrian, Mich.

I think that it is very bad practice to attempt the control of an electric iron by means of a pull socket. In the pull socket, the very nature of the mechanism is sufficient to advise against the use as mentioned in the question. As is known, the motion to the rotating parts of the socket is imparted by a pull on a chain. The time element enters into this motion and the movement is considerably slower than the movement of the parts of a snap switch. This tends to allow the arc to drag or to hang on. Again, one of the brass contact parts rubs on a piece of unglazed porcelain. In time there is deposited on this porcelain a film of brass. This may build up until it becomes a conductor of electricity and the result is that a short-circuit is formed. This film of brass may not form a complete path for the current but when the arc of breaking is formed the brass is voltalized and this bridge, of really molten metal, carries current, heat is developed and parts of the socket are melted into a mass. Perhaps the best reason for advising against the use of pull sockets for heating devices is found in the National Electrical Code. Rule 72*b* says the allowable current on a pull socket is not over 2.5 amperes. Rule 25 says that heating devices must be controlled by an indicating switch, and protected by a cutout. Over 660 watts the switch must be double pole.—D. S. J., Pittsburgh, Pa.

No. 137.—Gas-Electric Cars.—What kind of motors and what system of control are used on gasoline-electric automobiles and railway cars?—P. B. V., San Antonio, Tex.

The gasoline-electric railway cars with which I am most familiar are those built by the General Electric Company. These cars are equipped with standard 600-volt railway motors and the speed is controlled by varying the voltage impressed on the motors. This is obtained by the usual series-parallel arrangement with the added feature of voltage variation by adjustment of the generator fields, the main generator being separately excited from a small dynamo provided for that purpose. Both the main generator and the exciter are carried on an extension of the shaft of the gasoline engine. The above system of speed control allows the engine to operate at its most economical speed at all times, and the variable-voltage system avoids the large resistance losses of the ordinary constant-voltage systems. Articles appearing in the German and British technical papers during the past year indicate that it is also European practice to use series railway motors for such cars and control the speed by varying the voltage impressed on the motors. Some of the gas-electric automobiles operate in the same way as the G. E. railway cars; some have a separate motor in each hub and some are a combination of electrical and mechanical drive. In one type the gasoline engine drives the machine through the usual shafts and gears, the electric part consisting of a dynamo direct connected to the gas engine, and a storage battery. The dynamo can be operated as a motor for starting, and to assist the engine on heavy grades, or as a generator for charging the battery when the load is light. The gas-electric automobile seems to be in the experimental stage and practice has not yet been standardized.—F. E. V., Madison, Wis.

No. 138.—Electric Fly and Rat Traps.—Can a voltage less than 110 be used successfully in electric fly traps? What is the best voltage for electrocuting rats and mice?—M. A., Johnstown, Pa.

The writer lacks information on the electrocution of insects, but some years ago he was situated where he had available some extra time, several sources of electricity, and a superabundance of rats. The rats became the subjects, rather unwillingly, of the following experiments: A large square piece of tin, having been cut so as to leave a hole about 1.5 inches square in the center, was placed near a runway. A bait of meat was claced in the center. The two poles of a 1,000-volt, 60-cycle source of alternating current were connected to the meat and to the tin, respectively. The same thing was later tried, using 500 volts direct current. I remember that a rat sampled the bait each time; I was so informed by a very surprised and loud squeal; and one time the rat either was thrown or blindly ran against a pail a few feet from the trap. I next made a box about four inches deep, covered the bottom and lined the edges with metal. The 1,000-volt source was connected to the points, and bait was strewn on the bottom. A rat climbed into this, fell in, squealing, jumped out and ran away. All of these rats were gone when I reached

the place. Atfer this I was not troubled less with the rodents but was unsuccessful in further attempts to cultivate their appetite for electricity. I have nearly first-hand knowledge of a rat which had a very thorough treatment with 220-volt, 25-cycle alternating current. This rat was caught in a trap consisting of a wire cage that was connected to one side of the circuit, the other side being connected to a stiff wire insulated except for one or two inches at the end. The wire was thrust against the rat's body, to his violent resentment. He would grab the wire in his mouth, but found it too "hot" to hold. The wire was then again thrust against the rat's body by his tormentors. I do not know how long this was repeated before the experimenters became tired. In view of the above, the writer is much amused by the fact that he sees almost weekly notice of issue of patent for an electrical rat-trap. Perhaps, though, the rats mentioned by the writer were an unusual breed—they lived in the shops of the Westinghouse Electric & Manufacturing Company, and may have been brought up on electricity.—R. W. A., Pittsburgh, Pa.

No. 139.—Overhead Cables for Light and Power.—Telephone companies in the large cities are now generally using overhead cables in the alleys with only the drop wires to the individual subscribers as open-wire lines. Has this method ever been used for electric light and power distributing circuits? Is it feasible for this purpose? About what would be the relative cost of such distribution compared with the present plan of having all alley wires of the open type?—E. L. T., Birmingham, Ala.

It must be borne in mind that there is a great difference between telephone service and light and power service. In telephone work it is necessary to limit the number of instruments on each circuit or "line" to from one to five. Each circuit or "line" is entirely independent of every other circuit, and runs directly to the central office. It will therefore be seen that to serve subscribers in a district which is at all congested, requires that many wires be run, and consequently the method of construction stated in this question is employed. In light and power service, it is not necessary that the subscribers be kept on separate circuits running back to the central station, but many may be connected across the street mains, or fed from transformers connected across these mains, or from secondary mains connected to the primary mains through transformers. In either case cabling is unnecessary. —V. A. R., Ansonia, Conn.

I know of only one place where service connections have been cabled in a manner similar to the telephone distribution method, and this case was an exception to the usual run of conditions. It occurred in an industrial plant where an underground cable line for a 250-volt service was required to pass an acid-process building. Trouble was experienced in the cables due to seepage of the acid which destroyed the armor of the cable. A plan was then devised to place about 750 feet of this cable above ground. As the overhead space was so restricted as to prohibit the use of open lines the six No. 6 B. & S. stranded conductors were made into a cable and placed on poles. The method used was to employ a cable clamp suspended between two strain insulators held by a bracket. One end of the cable ran to a closed pothead to the underground cable and the other to a distributing pothead to the building service entrance about 20 feet from the head. This is not a feasible plan except under some special conditions and then it is impracticable with the large service connections on account of the cost of making and handling the cable, the latter being due to its stiffness. A cable having service wires of such size as to feed a congested city block would be so large and heavy as to require an enormous extra amount of labor to install. Should one pair of wires fail, the whole length of cable would have to be taken out.—H. E. W., Chicago, Ill.

No. 141.—Use of Control Resistors as Heaters on Electric Cars.—The grid resistors used in connection with the control equipment on motor cars of elevated railways seem to dissipate a great deal of heat. Has any attempt ever been made to utilize this heat in place of, or as an auxiliary to, the electric heaters usually employed for warming the cars in winter?—J. T. A., Chicago, Ill.

The plan referred to has been tried, and is at present in use on some systems, but has not met with much favor, owing to the fact that on warm days, when heat in the car would be objectionable, there must be another set of resistors located outside the car. This necessitates duplicate apparatus. A system of dynamic braking is also in use whereby the voltage generated by the motors while running as generators (in the operation of braking) is impressed upon the resistors, causing a heating current to flow. The amount of energy dissipated by the resistors depends on how often and under what conditions the car starts and stops. It is evident that on cars making long runs with infrequent starts and stops, this system could not meet with much success.—V. A. R., Ansonia, Conn.

Positions Open in the Bureau of Standards.

The United States Civil Service Commission has announced an open competitive examination for associate physicist, at salaries ranging from $2,000 to $2,700 a year, in the Bureau of Standards, Washington, D. C. The salaries paid will depend upon the qualifications of the eligibles selected. It is desired that applicants have a thorough scientific and engineering training and several years of practical experience in electrical engineering work. The duties of the position require a knowledge of engineering practice in the transmission and distribution of energy and the ability and judgment to make a scientific study of how to reduce the life hazard in electrical practice, and what regulations can be put in force in cities and states to reduce such hazard. Competitors will not be required to appear for examination but will be rated according to their general education and scientific training, practical experience and fitness, and publications or thesis. A training equivalent to that represented by an engineering degree from an institution of recognized standing is a prerequisite. Applicants must be between 30 and 45 years. Application form 304 should be secured from the Civil Service Commission and filed not later than June 2.

On June 4 an examination will be held for testing-machine operator at the usual places. Vacancies at salaries from $1,200 to $1,800 a year are to be filled. Practical experience in the construction or operation of an Emery testing machine is a prerequisite. Application form 1,800 should be secured.

Electrical Exports for March.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has issued its monthly summary of the imports and exports of the United States for March.

A new record was established in March in the total value of electrical shipments. This total was over $200,000 in excess of the previous monthly record established last November. It was also nearly 36 per cent greater than the total of the corresponding month of 1912. The detailed figures are given below:

Article	No.	Value
Dynamos or generators		$136,812
Motors		381,583
Fans	4,302	43,460
Arc lamps	505	9,186
Carbon-filament lamps	152,045	19,423
Metal-filament lamps	100,641	26,085
Telegraph instruments (including wireless)		17,774
Telephones		120,181
All other		1,734,870
Total, March, 1913		$2,489,374
Total, March, 1912		1,833,680

Indirect Lighting Proposed for Street Illumination.

In a recent discussion of street lighting before the Illuminating Engineering Society of Great Britain a remark was made by J. Darch that he looked forward to a time when streets would be illuminated by a system of indirect lighting in which the light would be thrown against the house fronts and reach the street by reflection therefrom, thus eliminating the objectionable glare attendant on all methods of direct lighting and producing very uniform illumination.

Third Annual Convention of the Tri-State Water and Light Association.

With some 50 delegates of the three states present, the Tri-State Water and Light Association of the Carolinas and Georgia met in annual convention at Charlotte, N. C., April 16 and 17, Meetings were held in Hannah Hall of the Y. M. C. A. The first meeting was called to order by C. C. Hook, president of the Greater Charlotte Club, who introduced Mayor Charles A. Bland of the City of Charlotte. Mayor Bland extended a cordial welcome to the delegates and paid a tribute to the work being done by the leading water systems. The response was made by A. J. Sproles, superintendent of water and light of the City of Greenwood, S. C. The meeting was then called to order for business by the president, W. F. Stieglitz.

The balance of the morning session was devoted to miscellaneous business matters, appointment of committees, and the presentation of a paper by G. H. White, of Columbia, entitled, "The Effect Purification of the Water Supply Has Upon General Health."

The afternoon session was opened with the report of the Question Box Committee following which M. F. Corin, of Philadelphia, presented a paper on "Preventable Economic Losses and Remedies," which dealt with boiler-room practice. The author has no faith in the so-called "smoke consumers" and he feels that greater economics can be effected by intelligent handling of fires. He cited a great many instances where little troubles which are usually regarded as of no consequence, if observed and remedied would result in great savings in the coal pile as well as the boilers. The protection of the boiler from cold air, by proper setting and covering, saves much fuel waste. Mr. Corin stated that soot was three times as good as asbestos, commonly regarded as being the best non-conductor of heat. A proper mixture of air was another source of saving of fuel mentioned. Mr. Corin spoke at length regarding the formation of scale in the boiler, pointing out that this is the one thing that caused the greatest amount of waste in fuel. He stated that a scale one-sixteenth of an inch in thickness in the boiler, cut down the effect of the fuel 15 per cent; a scale one-quarter of an inch thick cuts down the effect of the fuel from 35 to 40 per cent and a scale one-half inch thick cuts down the heating power of the fuel about 60 per cent.

He told of many mixtures prepared for boilers but in all of them there was some feature probably as bad as the loss of fuel. Those mixtures which contained soda or phosphates and organic matter soon may cause priming, while those mixtures which contain any of the acids such as tannic acid eat the packing and cause the boilers to corrode. Mr. Corin thought the proper way to handle this trouble was to "treat the boiler for the water, not the water for the boiler."

The next talk was by A. M. Schoen, a representative of the Southern Underwriters' Association, who spoke on "Fire Prevention and Fire Protection." Mr. Schoen spoke of the underwriters of olden days when each state had its laws. He then talked very briefly on electrical subjects stating that at their last meeting in New York the underwriters had decided to push the use of sockets which would carry five amperes in the place of the 2.5-ampere socket generally used. This was on account of the almost universal use of electric irons, vacuum cleaners, etc.

He then touched on electrolysis in water pipes, stating that the only way to eliminate this was by the use of double trolleys or an underground system, stating that the latter was entirely too expensive for small cities.

He showed that the per-capita cost of insurance in Europe was about 33 cents, while in America it was $3.50 per capita. He spoke of the San Francisco conflagration, having a direct bearing on the panic of 1907.

At the close of his talk Mr. Schoen answered many questions. He laid particular stress upon electric wiring, believing that whenever practical wires should be placed underground.

There was then quite a discussion regarding the grounding of secondaries and Mr. Schoen said that it had been practically decided that where the difference in potential was as much as 150 volts the neutral should be grounded.

Regular order of business was again taken up and Messrs. Hubbard, Dus and Spruell were appointed a committee to prepare a blank accounting form for the use of the delegates so that a uniform comparison of the cost of maintenance of water and light systems could be had.

Due to a delayed train, Mr. Ludlow, the speaker of the evening, was absent and the greater part of the evening was devoted to discussions, which was followed by a talk by F. M. Corin on coagulation and filtration

The meeting on Wednesday morning was called to order by President W. F. Stieglitz. As there was no unfinished business new business was taken up and it was decided that three field secretaries, one from each state, be appointed, to boost the association.

F. M. Laxton, of Tucker and Laxton, then spoke on "Electricity in Water Purification." Mr. Laxton stated that the uses of electricity in water purification are not direct in the sense that would be meant if the current was employed directly to the water, but are indirect in the production of secondary forms of energy that are used to perform the actual work. He stated that this was accomplished in two ways: first, the one which formed active chemicals by the electrolysis of the water or brush discharge in the air; and those employing the current in a metallic arc, which produced a light wave of high frequency.

He stated that it was not the claim of these systems to take the place of the ordinary process of filtration but in some cases the rate can be considerably increased. Describing the first system, Mr. Saxton stated that the effect of ozone on organic matter was simply combustion. The best way to bring the ozone in contact with the water is by the use of spray towers, the only disadvantage of this being a loss of ten to fifteen feet in the head of the entire water supply. A concrete tower having a proper area for the capacity of the plant should be provided and about ten feet between the floor and top allowed. Spray nozzles that divide the water into a very fine spray are placed on the floor and the water falls into water basins below. The ozone is blown directly into this tower from the ozonator and while the contact with the water is only of few seconds' duration, due to the water being finely divided, sterilization is secured without difficulty.

In one plant two Girard ozonators, each consuming 400 watts and having a capacity of 1,000 gallons per hour, were installed. The combined input including blower, did not exceed one kilowatt-hour, this not taking into consideration the 20-foot loss in head between the filters and clear well.

Next was filtration by means of ultra-violet rays. The latest equipment is very simple and so constructed that the water flows in practically a semicircle around the light and by the use of proper reflectors on top, gives to the water fully 75 per cent of the ultra-violet rays emitted. The quartz tube cannot be brought in contact with the water on account of lowering its temperature and greatly reducing its efficiency. This tube is made in standard units consuming 660 watts at 220 volts direct current. A tube of this size is capable of sterilizing approximately 4,000 gallons of clear water per hour. This is about 6,000 gallons per kilowatt-hour, which is a great deal higher efficiency than has been obtained by the ozone system and without

the loss of head. Mr. Laxton stated that the latter system could not be procured in this country at present, but one of the large manufacturing companies had purchased the rights and had a corps of engineers working on it at this time.

The next speaker was J. L. Ludlow, of Winston-Salem, N. C., consulting engineer of the North Carolina Board of Health, who spoke on "Conservation of Purity of Public Water Supplies."

The next speaker was J. H. Finney, of Washington, D. C., who spoke on "The Protection of Water Sheds and the Conservation of Supplies." This was a very interesting talk along the lines of "Forest Conservation."

Following Mr. Ludlow came E. V. Plane of Fostoria, O., who presented a very interesting paper on the "Efficiency of Lamps."

Based on the assumption that one of the principal objects of the central station is to furnish a satisfactory and economical light to its customers; and at a profit to the station, this paper discusses lamp performance and how it is affected by various conditions.

It is evident that mainly speaking, the effort to secure the most economical service from a lamp is principally a question of the efficiency at which it is to be operated. For any given lamp of known voltage rating, the efficiency is governed by the pressure at which current is supplied to it. Therefore, the problem of maximum economy is solved by maintaining the correct relation between lamp voltage and line voltage. Since maximum economy depends on the line voltage and since fluctuation of intensity is governed by variation of voltage, the question of the proper lamp for circuit can be referred to the value and variations of this one quantity—voltage. Therefore, the proper lamp for a circuit depends upon the conditions surrounding: plant operation; and transmission of energy.

Of course, plant operation and conditions governing same vary with the size of the central station. Upon investigation of conditions in 94 central stations, in towns varying from 1,500 to 15,000, it was found that only 19 had accurate switchboard meters—of the remaining 75, there were 49 that were reading high, a few as far off as ten volts. Twenty-six were found to be low, but only four of these were off more than four volts. It might be said here that alternating-current voltmeters are more apt to read high than low.

The transmission of energy from the central station to the lamp socket is a very important step to be considered in placing the proper lamp on the circuit. It is in this step that the greatest voltage losses occur. The usual designs of feeder systems aim to take care of the voltage drop within 2 per cent. It is realized, however, that in a commercial installation that must supply various classes of load, this condition is seldom attained.

It often happens in small cities, that the feeders which supply the business section also supply some of the residence section. It is obvious that the maintenance of a uniform voltage over the entire system—where the peak load of the business and residence sections do not coincide, would be practically an impossibility without suitable feeder regulators, regardless of the uniformity of the station voltage. So the greatest care must be taken in line construction and proper allowances be made, especially where it is not possible to use feeder regulators. Due to the fact that the electric lighting industry has had such a rapid growth, many transformers have been overloaded—and there is another cause for voltage drop. Even when the drop in the generator and feeder is compensated for at the switchboard, by hand or automatic regulation, it is impossible to keep the voltage uniform all over the lines, due to the different loading conditions on each transformer. Here we must consider the importance of power-factor, for a low power-factor tends to still further drop the voltage. An 80-per-cent power-factor will cause a drop from 4 to 5 per cent at full load. Added to this transformer drop is the secondary line loss and the loss in the customers premises between service switch and sockets.

Under average conditions the secondary drop should not amount to more than two per cent, but upon investigation of several hundred cases under average conditions, it was found that the average secondary drop ranged from 4 to 5 per cent. This indicates the fact that the majority of secondary lines are over-loaded, which means a decrease in revenue to the central station and service to the customer.

Following this paper resolutions of thanks were accorded to the people of Charlotte for their hospitality, and to the various speakers.

The following officers were then named for the coming year:

A. J. Sproles of Garwood, S. C., president.

W. C. Wyse of Columbia, first vice-president.

George H. Habbard of Madison, Ga. second vice-president.

J. W. Neave of Salisbury, N. C., third vice-president.

W. A. Stubbs of Dillon, S. C., secretary-treasurer.

Manufacturers National Meeting at Detroit.

The Eighteenth Annual Convention of the National Association of Manufacturers will be held at Detroit, Mich., May 19, 20 and 21. Among the speakers at the convention will be Hon. Wm. G. Brantley, former member of Congress from Georgia; James A. Emery, general counsel of the National Council for Industrial Defense, on legislative tendencies; Harry A. Wheeler, president of the Chamber of Commerce of the United States; Hon. Joseph Johnson, Fire Commissioner of New York City, on "Fire Prevention and Fire Insurance;" James O. Fagin, the towerman-author, on "The Riddle of the Railroads"; Gilbert H. Montague, of the New York Bar, on "The Assaults on the Patent System: What They Mean to Manufacturers"; District-Attorney Charles W. Miller, of Indiana; William J. H. Boetcker, of the Citizens Industrial Association, of Toledo, Ohio, and Joseph W. Bryce, president of the Trades and Workers Association, on the "Open Shop"; Hon. R. G. Bremner, Representative in Congress from New Jersey, on the establishment at Washington of a national museum of safety. The opening address, on May 19, will be by Mayor Oscar B. Marx, of Detroit, to be followed by an address of welcome by James Couzens, president of the Detroit Chamber of Commerce.

In connection with the report of the committee on Accident Prevention and Workmen's Compensation there will be a notable exhibit of safety devices; Ferd. C. Schwedtman, chairman of the committee, will deliver an address, incidental to which lantern slides and moving pictures will be shown, followed by a discussion by J. A. Roberts, of the Eastman Kodak Company, Rochester, N. Y.; J. P. Douglas, of the United Gas Improvement Company, Philadelphia, Pa.; and L. B. Robertson, of the Ford Motor Company, Detroit, Mich., and others. The session devoted to industrial education will consist of a report by the committee and addresses by H. E. Miles, chairman, and Dr. John H. Leete, dean of the School of Applied Science of the Carnegie Institute of Technology, Pittsburgh, Pa. A moving picture play devoted to industrial education will also be exhibited.

Reduced railroad rates to the convention in effect May 18 and good to May 31, are available from many central points, and special trains have been arranged for at Boston and New York for the benefit of members from New England and New York and adjacent states. Information in regard to transportation may be had of local agents.

Electric Decorations for the United Confederate Veterans at Chattanooga.

The reunion of the United Confederate Veterans will be held at Chattanooga, Tenn., May 27, 28 and 29. This will be of more than ordinary interest because of the fact that 1913 is the semi-centennial of the famous battles of Chickamauga, Missionary Ridge and Lookout Mountain. Chattanooga is making elaborate plans for the entertainment of the veterans and other visitors. In addition to $53,000 for entertaining the veterans, $26,000 has been raised by merchants on the main business streets for a mile and a half of an illuminated "Great White Way" that will become a permanent installation. There will be miles of decorative material to ornament the factories, stores and residences by day, and 11,000 lineal feet of electrical festoons for private illumination at night. A special railroad rate of one cent a mile has been made and this will enable the visitors to look over the great hydro-electric projects, aggregating some 146,000 horsepower. Paul J. Kruesi, treasurer and manger of the American Lava Company of Chattanooga, is prominently identified with the arrangements.

Ornamental Tungsten Lighting of Jackson Boulevard, Chicago.

The South Park Commission, which has control of the parks and boulevards on the South Side of the City of Chicago, has practically completed the installation of 82 ornamental standards, each bearing a cluster of N 100-watt tungsten lamps, on Jackson Boulevard between Michigan Boulevard and the Chicago River. This boulevard forms the only connection through the central business district between the south and west park and boulevard systems. It is lined almost entirely with modern office buildings, the Federal Building, Board of Trade, hotels and theaters.

The new lighting equipment is exactly of the same type as used on Michigan Boulevard, illustrated descriptions of which were given in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 3, 1910, and September 16, 1911. The six lamps on each standard are suspended from as many ornate brackets and are all on the same level, 15.5 feet above the pavement. On account of the location of cross streets in the neighborhood of the Board of Trade, the opposing standards in that vicinity are arranged in staggered fashion. All the remaining standards are placed directly or almost directly opposite each other. The lamps used are 100-watt, 115-volt Sunbeam Mazda lamps. About each is a 12-inch Alba diffusing globe.

DETAILS AND DESIGN OF HIGH-TENSION TRANSMISSION LINES[1].

By H. W. Garner.

This article will be confined to a discussion of transmission lines of moderately high voltage, and will endeavor to bring out the following points: résumé of present type of construction work in Iowa; some details of transmission-line construction; actual cost of 11,000-volt steel line constructed by the writer in 1912.

Consideration of typical constructions as disclosed by reports on lines now built in Iowa show a wide difference in quality of construction and class of material.

It appears to the writer that some of the lines that have been built are the merest makeshifts, and that it is only a matter of time until the owners will face a heavy maintenance charge and ultimately reconstruction. It is also a question whether these lines can furnish reliable uninterrupted service, that the small community has a right to demand as well as the large.

The cost of line construction exhibits a wonderful range and one is confronted with the question "What is good construction and average cost?" for this class of service.

Table I gives a list of some of the transmission lines now in operation in Iowa.

The cost of construction complete of the lines varies from $350 to $1,500 per mile.

Inasmuch as these lines are furnishing very nearly the same class of service to the communities they serve, the question arises "Where does poor construction leave off and good substantial construction begin?"

It appears to the writer that there are a large number of communities in the state which are of sufficient size to furnish profitable revenue for large central-station service, and that these communities in time will demand good reliable service in the line of power and artificial illumination. This is evidenced each day by the large number of inquiries which are received from small prosperous communities for 24-hour electric service from the large cities. A marked increase in efficiency, sturdiness and simplicity in design of transmission equipment, protective apparatus, and devices for voltage regulation has opened up a new field to the central station.

Since the investment in the transmission line is probably the chief factor in the consideration of the return from operating, the prospective builder of a transmission line has the peculiar problem of determining a class of construction, which, while being economical in first cost, will not depart from the requirements of good practice from an operating standpoint. On small lines the possibility for revenue from the various communities traversed is the determining factor in arriving at probable construction cost. It would therefore seem that style and cost of construction would possibly fall under the two classes:

(*a*) Lines radiating from one small locality to other small localities.

(*b*) Lines radiating from large central stations to various smaller localities with prospective extensions not built.

TABLE I.—TRANSMISSION LINES IN IOWA.

	Miles	No. of phases	Pole material and type of construction	Pole height in feet	Wire No.	Pole spacing in feet	Voltage
Red Oak to Villisca (farm land and railway right of way)	18	3	Cedar and fir arms	25—30	6	120	13,200
Malvern to Tabor (railway right of way)	9	1	Wooden	30—35	6	113	10,000
Wolcott (highway)	6	3	2-arm double circuit	40	4	125	33,000
Dallas Center (highway)	8	1	Wooden	25	8	125	6,600
Boone to Perry (Private and highway)	36	3	Byllesby Wishbone	30—35—40	4	140	38,000
Trayer to Fort Dodge (right of way)	33	3	Wooden	35	2	200	22,000
Kelleston (highway)	10.5	1	Wooden	30	6	130	6,600
Scranton (highway)	12	3	Wooden	25	8	125	6,600
Griswold to Elliott (highway)	7	3	Wooden	30	10	150	6,600
Carson to Emerson (private)	18	1	Wooden	25—30—35	6	200	16,500
Oskaloosa to New Sharon (highway)	16	1	Steel	45	6	270	11,000
Clarinda to Bedford, Corning and New Market	31	3	Steel and wood	36	6	260	13,000

1 Paper read at convention of Iowa Electrical Association, Waterloo, Iowa, April 22-24, slightly abridged.

TABLE II.—ANALYSIS OF COST OF BUILDING TRANSMISSION LINE.

		Total cost	Cost per mile
Report, plans and maps	$184.50		
Engineering and location cost	128.82	$312.32	$19.52
Right of way		80.85	5.05
Tools purchased		115.31	7.20
Sand (322 tons at 98 cents)		317.37	19.84
Cement (195 barrels at $1.22)		238.97	14.94
Crushed rock (21.9 tons at $1.92)		42.25	2.64
Insulators (815 Locke)		244.94	15.31
Miscellaneous line material		415.69	25.99
Miscellaneous construction charges		219.26	13.71
Poles complete with iron arms, braces and pins (including freight)		6,940.81	433.81
Transmission copper (13,682 pounds at 17 cents)		2,325.91	145.37
Construction cost, labor and teams		4,458.81	278.62
		$15,712.49	$982.00

For the first class, it appears the wooden-pole construction can be installed for single-phase lines, using No. 6 bare copper wire, at prices ranging from $500 to $1,200 per mile complete.

One of the lines, using 30-foot, 6-inch-top poles on railway right of way, with No. 6 wire, poles spaced about 50 to the mile, reports cost as low as $350 per mile.

A line of about the same length, using 40-foot poles, three-phase, No. 4 wire, and poles spaced 125 feet, reports a cost of $1,536 per mile, built along the highway.

One of the longest lines now operating in Iowa, with 35-foot poles, No. 4 wire, three-phase, and built on private right of way, reports cost of $1,200 per mile.

For the second class, it appears to the writer there is but one class of construction to be considered, namely, the most sturdy and enduring style of construction, safeguarded and protected by every device, which will secure reliable service, freedom from costly maintenance charges, and long life in the material.

These requirements open up opportunity for differences in opinion in determining the style of construction, but transmission-line building is far enough advanced to have presented several well defined styles of good and enduring qualities.

The wooden pole is today most widely employed for the support of the lines, but the advent of steel poles and the use of cement are in many instances offering a cheaper and stronger construction.

The following is an actual report on the detailed cost of a 16-mile transmission line which was constructed last year.

In the spring of 1912 the company operating in Oskaloosa determined to build to the town of New Sharon, a prosperous and enterprising town of 1,200, dependent on its surrounding agricultural resources for its support. The local plant had come to a disastrous failure after an investment of some $20,000 covering a period of years. The local plant was purchased and scrapped and new franchises were granted. The writer determined to build a substantial line and start business with all the physical equipment in good order. Under a skilled foreman every service and primary line in New Sharon was reconstructed.

TABLE III.—CONSTRUCTION COST ITEMIZED.

Foreman 30 weeks	$ 703.01
Linemen 30 weeks	1,211.04
Groundmen 30 weeks	781.56
Electricians 5 weeks	78.43
	$2,774.04
Boarding and lodging enroute	740.81
Wagons and teaming poles, sand, cement and clearing right of way	943.96
	$4,458.81

The main highway between Oskaloosa and New Sharon is monopolized by the Bell Telephone Company and the Independent Telephone Company, operating rural lines. In order to avoid telephone interference, the company endeavored to secure consent for private right of way on farm lands. After a month of unsuccessful negotiations, this plan was abandoned as we found that one or two farmers were effectually blocking the plan in hopes of securing large damages for consent. The line, as finally located, extends 16 miles along a highway not considerably used by the telephone lines.

The line, constructed for three-phase operation, is supported by light-section steel poles of the Tripartite style, these poles being suitable for distribution lines and other work where the wiring is not heavier than six wires of No. 4 copper, in spans not greater than 250 to 300 feet. The minimum thickness of the metal is one-fourth inch and the durability of the construction is equal, we believe, in every respect to the usual heavy type of structural-steel construction.

The pole is composed of three pieces of steel U-bars, rolled in one piece, arranged at angles of 120 degrees around the axis of the pole. These three members are bound together with collars and spreaders. The pole is rigid and has great strength and comes completely assembled and painted. We believe by the use of this pole, the factor of depreciation is reduced to the minimum and the strength of the pole is unlimited. As the pole is completely assembled, there is no additional cost for trimming, cutting, boring and other labor—nothing but cost of erection.

These poles were unloaded at three points, together with sand, cement and line material, installed under the supervision of a competent line foreman, the working force being housed at camps located at farm houses along the route.

The poles, 311 in number, consisted of the following: 249 45-foot poles, 34 40-foot poles, 28 35-foot poles, total weight, 285,605 pounds; average, 757 pounds.

The poles were equipped with steel arms and steel pins, and were set in concrete and rock mixture and erected by means of a gin wagon. The actual construction cost complete, is shown in Tables II, III and IV. The average pole spacing was 270 feet.

No. 6 hard-drawn copper wire having a tensile strength of 61,500 pounds per square inch and 98-per-cent conductivity was used. For a single-phase line, for which the cost is given, 32 miles of wire was required, estimated at 419 pounds per mile.

This line presents what we believe is high-class construction, substantial and adequate for the use of the community it now serves and susceptible to addition and extension. It can be used as a main trunk line for an extensive system, or can be connected to additional outlying towns, already applying for the service.

After six months' operation of the line, there has been no development that would indicate any weakness in construction.

TABLE IV.—ANALYSIS OF LABOR AND TEAM CHARGES.

	Total labor cost	Total team cost	Labor cost per mile	Team cost per Mile
Location	$ 88.00	$ 24.42	$ 5.50	$ 1.52
Excavation	287.36	117.29	17.95	7.33
Erection	987.68	131.91	61.73	8.24
Trimming trees	519.68	48.47	32.47	3.02
Pulling wires	431.04	94.35	26.95	5.89
Distributing poles	569.92	.....	35.62	....
General handling material	631.17	.....	39.44	....
General hauling	.....	527.52	.....	32.97
	$3,514.85	$943.96	$219.67	$59.00

Reduction in Cable Rate to Alaska.

The rate on commercial messages to Alaska *via* the United States military cable between Seattle and Sitka will be reduced 50 per cent on July 1 of this year.

The Corrosion of Iron.

At the meeting of the Faraday Society on April 4, conjointly with the Manchester Section of the Society of Chemical Industry, a general discussion on "The Corrosion of Iron and Steel" took place.

Bertram Lambert read a paper on "An Electrolytic Theory of the Corrosion of Iron." It was shown that a simple and natural development of the ideas of Faraday on electrolysis will give the foundation of a satisfactory theory of the corrosion of iron. Commercial iron is always heterogeneous in character, and, when a piece of such metal is placed in an electrolyte like water, the electrically different parts—whether the potential differences be due to impurities or to different forms of the metal—tend to set up an electric current between them, with the passing into solution of the metal at the relatively electropositive points. There is no doubt that iron is, practically speaking, insoluble in water, in vacuo—at any rate chemical tests will not show the presence of iron in solution even after long periods. But it is generally agreed that iron must pass through a process of solution before rusting, and therefore oxygen must alter the conditions in such a way that iron can pass into solution in water in its presence. Oxygen probably plays two different and distinct functions in the rusting of iron: (*a*) it helps the iron to pass into solution in the water by electrolytic action, probably by oxidizing the film of hydrogen at the electronegative points—a non-conducting film which would, unless removed, reduce the strength of the current to a negligible value. Since iron only goes into solution by the passage of an electric current, so long as this film, which is formed the instant the iron is put in the water, persists, no appreciable quantity of iron can dissolve; (*b*) the oxygen produces ferric hydroxide (rust) from the dissolved iron. The ferrous ions produced when the iron passes into solution cannot be oxidized to ferric ions by molecular oxygen. They first combine with the hydroxyl ions, always present in water, to form undissociated ferrous hydroxide, and this is then oxidized to ferric hydroxide by the oxygen. The properties of chemically pure iron were shown to give very substantial support to the theory.

W. W. Haldane Gee delivered a lecture, illustrated by experiments and lantern slides, on "The Electrolytic Methods for Preventing the Corrosion of Metals." He showed that the corrosion of metals can be lessened or prevented in two ways: (1) by connecting the metal to be protected to a more electro-positive metal, so that a primary cell is produced; (2) by making the metal to be protected the cathode in an electrolytic cell supplied by an external electrical pressure. Various types of primary cell arrangements that could be employed in practice were classified. The efficiency of the cell for protection will depend on the current density at the cathode, and this will be controlled by the resistance of the cell and the effective voltage. The importance of overvoltage in determining the effective voltage was discussed. The history of Humphry Davy's application of zinc and iron protection for the prevention of the corrosion of the copper sheathing of ships and subsequent inventions for the protection of condensers and pipes were detailed. The patents of Harris and Anderson, in which aluminum alloys are used for the prevention of the corrosion of condenser tubes, were shown to be primary-cell methods. In the case of the use of zinc in boilers was involved a knowledge of the electrolytic resistance of the boiler waters and the effective voltage at temperatures from 150 to 200 degrees centigrade, concerning which there is great need of experimental data. The amount of zinc used in some marine boilers is as great as from 400 to 600 pounds of rolled zinc per annum. If the zinc is efficient in producing electrical currents then the average current may be from 17 to 25 amperes. It was obvious that such currents would be obtained much more economically by the use of a dynamo. The direct use of electrical currents has been the basis of a number of patents. Those of Elliott Cumberland were described. Iron anodes are placed in the water of the boiler, which is made the cathode. A low voltage of supply provided by a small motor-generator is used. The method has proved effective not only in preventing corrosion, but also in removing scale from the heating surface and preventing its formation. Experiments carried out at the Manchester School of Technology have shown that the current densities necessary to protect iron, copper, and other metals from the corrosion of fresh and salt water are of low value, and hence in the cases of boilers and condensers the annual cost of the electrical energy required is a small item. The chief cost will be in the renewal of anodes. Harris and Anderson have also applied electrical currents tor the prevention of the corrosion of condensers. They find that a condenser with a cooling surface of 1,025 square feet requires only 2 volts and 2 amperes. The use of electrical currents may also be applied in chemical works to prevent the corrosion of metallic screens and vessels from acid liquids.

J. T. Crabtree read a paper on "The Nature of Overvoltage." This may be regarded either as the excess of the anodic or cathodic decomposition voltage of a dilute acid with a given electrode over that for platinized platinum, or as the excess of the back electro motive force set up as an electrode (anode or cathode) after polarization over that set up by a platinized platinum plate under identical conditions. This back electromotive force was determined by alternately polarizing an electrode and measuring its single potential difference by means of a potentiometer, alternate connection between the latter and the primary circuit being made by means of a rotating commutator. Overvoltage is affected by the time of application and current density of the polarizing current, the nature of the electrolyte and electrode employed, and by the thickness of the latter. Since these factors also affect the back electromotive force of platinum, a comparison electrode was employed consisting of a thin deposit of platinum on Jena glass, the back electromotive force of which is constant with time.

It is probable that overvoltage is simply a manifestation of the difference between the rate of production of ions at the electrode and of the combination of these to form complexes. Probably after being discharged the ions pass into a metastable condition and give rise to a back electromotive force. Overvoltage may be of importance in the case of the corrosion of a metal as either. (*a*) having a tendency to retard the deposition of hydrogen or oxygen on its surface, which might tend to assist or prevent corrosion; (*b*) by setting up a high back electromotive force which would diminish the effect of a decomposing current in cases of corrosion due to electrolysis; (*c*) by assisting or preventing the solution of a metal.

Joint Meeting of Philadelphia Sections.

A joint meeting of the Philadelphia Section of the Illuminating Engineering Society, the Philadelphia Gas Works Section of the National Commercial Gas Association and the Commercial Branch of the Philadelphia Electric Company Section of the National Electric Light Association was held on Wednesday evening, April 23, in the Parkway Building, Philadelphia. Preceding the meeting a dinner was held at Hanscom's restaurant at which there were 67 present.

The meeting was presided over by Messrs. Elcock, Dyer and Rowland, the chairmen of the three societies.

An exhibition of both gas and electric industrial units had been prepared and the gas units were demonstrated by James Lee while Mr. Hazeltine, of the Adams-Bagnall Company, explained the exhibition of the electric units.

Thomas W. Rolph, of the Holophane Works of the General Electric Company presented the paper of the evening on "Metal Reflectors for Industrial Lighting."

The discussion was entered into by Messrs. Lee, Calvert, Headley, Dickey, Rowland, Ely and Israel.

Telephoning in Turkey.

Not so many years ago the unprogressiveness of the Ottoman Empire was widely commented on and from the publicity given this condition of national attitude of mind to some degree the Turk has suffered. It must be conceded, however, that the former Sultan was always keenly interested in electrical developments, and in fact, he was one of the earliest users of the electric automobile, the electric incandescent lamp and the electric telephone. An interesting commentary on this situation in the Turkish Empire is the "Societe Anonyme Ottomane des Telephones de Constantinople." Constantinople has a flourishing telephone company, with about 2,500 subscribers. The telephone directory of the company is unique and worth careful inspection. It is printed in French and Turkish, and literally begins at both ends. If the local manager of the Constantinople company should tell his

Front Cover of Telephone Directory.

advertising manager to go out and sell the inside back cover of the directory he would be in a dilemma, for there is no such thing. As the Turkish language reads from right to left the Turkish section of the directory begins at what would be the back of an ordinary book, and finishes somewhere near the middle of the volume.

Both covers of the directory bear an Orientalized blue bell of the Bell System printed, however, in a bright red, with its outlines far from symmetrical. As a matter of fact, it looks like a cross between a bell and a Turkish fez. The book contains about 150 pages, with 2,500 listings. The listings are arranged according to the exchange, number, name, profession and street address. There is also an advertising section with several colored inserts and several American industrial companies of worldwide fame are among the advertisers. The rules and regulations contain some interesting paragraphs. For instance:

"Service to be continuous, without interruption, day and night, but the company does not guarantee the continuity of service in the event of force majeure."

"The company will furnish free copies of its directory but does not guarantee the accuracy of its contents."

"Each subscriber's line will have a number and every call should be made by a number. The company has the right to fix this number and to change it at its will."

"The subscribers are required to keep the apparatus in good order and to abstain from any act which might injure it."

"The subscribers at flat rates must not allow the use of their telephones to any others than their employees or the employees of their families."

The company operating the Constantinople telephone system is a foreign syndicate which secured its concession from the Turkish Government in 1911, in competition with other foreign promoters who wished to enter the field.

If the system is not bought by the Government at the end of 30 years, the concession is extended for another 10 years. From the tenth year of the concession the Government has the right to buy the system at a premium of from 10 to two per cent. At the end of 30 years there is no premium on the purchase price and at the expiration of the 40-year period the price is determined by the amount required to complete the replacement on capital on the basis of a 40-year sinking fund. The government reserves a 15-per-cent royalty on the gross receipts.

The company is capitalized for 30,000 pounds. The stock consists of 60,000 shares common, par value five pounds per share.

The system is equipped with Bell telephone apparatus from the Western Electric Company.

Trademark for Electrical Development Society.

The Trademark and Slogan Committee of the Society for Electrical Development met in New York on May 6 and selected a design and a slogan from a large number of submitted suggestion and will recommend them to the Executive Committee of the society, which meets in New York on May 13. The committee on plan for the work of the society met at the same time and completed its report, which

A Page from the Directory.

will be submitted to the Executive Committee also.

J. Robert Crouse is chairman of the Plan Committee, and among other members appointed were George Williams, J. M. Wakeman, Philip S. Dodd, P. S. Young, Matthias E. Turner, F. H. Gale, P. L. Thomson, J. C. McQuiston, James B. Olson, A. A. Gray, Hugh M. Wilson, James I. Ayer and T. C. Martin. The four first named members of the Plan Committee constitute the Committee on Slogan and Design. There was a large attendance of the committee and considerable enthusiasm over the prospects for the future of the Society for Electrical Development was manifested.

Annual Meeting of Chicago Section, Electric Vehicle Association of America.

The first birthday party and second annual meeting of the Chicago Section of the Electric Vehicle Association of America was held in the Louis XVIth room of the Hotel Sherman, Chicago, on the evening of Tuesday, May 6. It was a most enthusiastic and inspiring affair; and from beginning to end everybody present (and there was a goodly crowd) enjoyed each incident.

The proceedings were opened by the chairman, George Harvey Jones, who reviewed the work of the year, outlining what had been accomplished by the various committees in connection with proper garaging facilities throughout the city, the effecting of changes in the street ordinances with regard to traffic precautions, the routing of heavy transportation through the alleys in one direction, the parking of vehicles, the disposition of second-hand cars, and the plans for a school for instructing young men for the handling of electric vehicles. There was an interesting and amusing contest over three topical songs submitted by W. J. McDowell, F. M. Nourse and L. E. Wagner, set to popular airs. Godfrey Atkin had volunteered to give a prize of one meal ticket to the contributor whose song received the greatest number of votes. The good natured crowd insisted that each song was as good as the other, and that Mr. Atkin be taxed for three dinners in order to show his appreciation of the great talent that had been demonstrated.

The election of officers resulted as follows: chairman, Homer E. Niesz; vice-chairman, D. C. Arlington; secretary and treasurer, W. J. McDowell. Mr. Niesz responded gracefully in acknowledging the incumbency and pledged the new administration to have work for the coming year.

It was voted to amend the constitution and by-laws so that the executive committee would include the officers and four members instead of two members. The executive committee, therefore, consists of the officers and W. L. Rudd, George H. Jones, Uri B. Grannis and L. E. Wagner.

John F. Gilchrist was introduced as toastmaster and he read a telegram of regret from Thomas A. Edison. Mr. Gilchrist announced that the national president of the Association, Arthur Williams, was unavoidably detained in New York, but that he had sent his representative, F. C. Henderschott. Mr. Henderschott brought the felicitations of Mr. Williams to the meeting and read a very able address that had been prepared by Mr. Williams. In his address Mr. Williams said that there were now about 30,000 electric vehicles in service, one-third of this number having been installed and equipped in 1912. So thoroughly had the electric taken hold that the manufacturers were confidently expecting to place in service not less than 15,000 electrics in 1913. The very rapid development of the industry, Mr. Williams believed, was due to organization effort and that co-operation was the force which was bringing the electric vehicle into its own. He reviewed the progress made in various cities where the central station had earnestly and actively taken up the matter of developing the electric-vehicle load, and predicted for the future an accelerated growth and a greater measure of success than had been witnessed heretofore. He referred to the very successful advertising and educational campaign which the publicity committee of the Electric Vehicle Association had carried on last year with an appropriation of $50,000. So satisfactory were the results that it had been decided to carry on another campaign this year and it was expected that at least $75,000 would be available. Under the direction of F. F. Phillips, of the United States Tire Company, the garage committee of the association would be able to do very important work in establishing garages in every part of the country for the proper handling of the electric vehicle.

He called attention to the fact that the next national convention would be held early in November in Chicago, and prophesied one of the best meetings that has ever been held.

N. H. Van Sicklen, president of the Automobile Trade Association, was scheduled for the next address, but was unavoidably absent and sent his regrets. In speaking of Mr. Van Sicklen, Mr. Gilchrist referred to a clipping which had appeared in one of the local dailies that morning, referring to Mr. Van Sicklen as the road rider who had participated in the last lap of the great bicycle road race from Boston to Chicago twenty years ago.

E. E. Witherbee, district manager of the General Vehicle Company, was referred to by Mr. Gilchrist as one of the youngest drum majors who ever wielded a baton, and he even at this advanced age still "led the procession." Mr. Witherbee talked to the subject, "The Significance of Electric-Truck Re-Orders." He called attention particularly to the fact that the big fleets of the country were electrics, and the electric was the only form of motor-driven transportation that had a past and did not have its record to make. The power wagon, long despised by both user and manufacturer, was now considered worthy of the notice of every manufacturer of vehicles of any type. The electric was succeeding in a most remarkable fashion because of its record of long life and the confidence which its past performance inspired in the new user, based upon the representations and observations of responsible men who had used them long in severe service and found that they had made good on every claim established. The electric truck was winning out on reliability and the owner of the electric was cashing in on what the electric truck had taught him. If the work to be done is in the field of the electric, no matter what other experiment the truck owner might make, the laws of economics would ultimately work out the justification of the electric drive. The field of the electric is recognized and nothing short of a panic now can prevent an immediate increase in its sales. While big users are buying other forms of trucks in single units, they really are standardizing on the electric as a trucking unit.

W. C. Anderson, president of the Anderson Electric Car Company, was the last speaker. Mr. Anderson claimed that until very recently the electric vehicle manufacturers had to fight their battle practically alone. There was now a fair degree of co-operation upon the part of central-station interests, but that this had not reached a point where the full benefit of the electric vehicle could be secured by the prospective customer, and so long as the central-station interests did not thoroughly and sincerely co-operate with the electric-vehicle manufacturers the industry would be to some degree retarded. He sounded a warning particularly to the central-station interests asking that they do not delay too long the seizing of the opportunity that their efforts to effect such changes in their rates for charging that there would be an immediate development in the energy output for the charging of storage batteries on electric vehicles, thus materially increasing their revenue while assisting in the development of the industry. He also discussed the methods of salesmen of electric vehicles and counseled the absolute elimination of vicarious discrediting of competitive equipment, and suggested that the salesman confine his efforts to a sincere attempt to sell his own car on its merits and let the other man's alone.

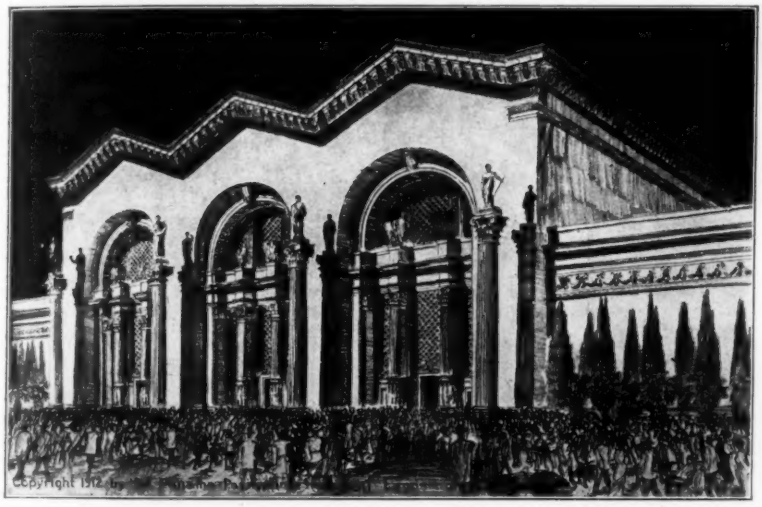
Godfrey Atkin called attention to the fact that F. J. Newman, president of the Chicago Motor Car Company, was very ill, and offered a resolution of sympathy and good wishes for his speedy recovery. This resolution was unanimously adopted.

The evening was enlivened by the chorus singing of popular airs, led by C. B. Roe ,of the Oxford Quartette. Miss Renee Dyris was also a charming and very much appreciated entertainer.

Machinery Exhibits at the Panama-Pacific International Exposition.

Rapid progress is being made in the construction of the main exhibit buildings at the Panama-Pacific International Exposition at San Francisco. The first of the buildings is now completed and five other structures are under way. There will be 14 main exhibit buildings, all of which are to be completed by July, 1914. Work upon the Machinery Building, the largest of the exhibit group, was begun early in the year and the framing of the main portion of the structure is partly completed. This will permit the complete installation of exhibits by the opening date, February 20, 1915.

The Department of Machinery Exhibits is thoroughly organized and filings for exhibit space have been received to an extent that assures a display commensurate with the importance of the industry. Early applications are especially welcomed by the Panama-Pacific management and will facilitate the proper grouping of the exhibits and the perfection of other arrangements essential to the interests of exhibitors as well as to the exposition.



Machinery Building as It Will Look When Completed.

The Machinery Building will have nearly eight acres of floor space. In addition there will be an auxiliary structure to be known as the Gas and Fuels Building. Electrical machinery, instead of being placed in a separate building, will be located in the Machinery Building and classed under the general heading of machinery. The structure will be 367 by 967 feet and will be decorated with ornamental cornices. The architectural design of the building is based upon the Roman arch motif, prototypes of which may be found in the big Roman baths at Hadrian and Caracalla. The interior arrangement consists of three naves 75 feet in width, 122 feet in height and more than 900 feet long.

All parts of the building will be served by adequate crane facilities. Electric current, alternating and direct, gas and water will be available in any portion of the building; compressed air and steam will be provided in a section adjacent to the Gas and Fuels Building. General illumination is to be provided by the exposition company, but a nominal charge will be made by exhibitors for other service they desire. Special rates for power will be made to exhibitors who use it to show machinery in motion.

The floor of the Machinery Building is designated for a load of 200 pounds per square foot. The soil conditions will permit adequate foundations for heavy machinery to be readily constructed.

No charge will be made for exhibit space. The management urges that concerns and individuals desiring to participate lose no time in getting into touch with the exposition company and filing applications for space.

Copies of the rules and regulations, documents as to the classification of exhibits, blank applications for space, and other information prepared for the guidance of exhibitors will be promptly forwarded on request to the Panama-Pacific International Exposition Company, San Francisco, Cal.

Philadelphia Company Section Activities.

The regular meeting of the Philadelphia Electric Company Section of the National Electric Light Association, was held in the Franklin Institute on April 21, 1913. The Peconela orchestra, which was recently organized among the company employees, furnished music at the dinner preceding the meeting and largely added to the attractiveness of the occasion.

Preceding the meeting, R. H. Silbert explained and demonstrated the various features of the "type B" installation system for meters. The demonstration aroused considerable discussion because of the recent adoption of this system by the Philadelphia Electric Company.

The address of the evening was delivered by Leslie M. Shaw, who spoke on the subject of "Aptitude Plus Application."

The Meter Department Branch held its most successful meeting of the year on April 4. Louis C. Smith, of the Installation Bureau, devoted the evening to a series of experiments and demonstrations with high-frequency and low-frequency currents at voltages ranging from 3 to 1,000,000 volts.

The April meeting of the Engineering Department Branch was held on April 7. The total membership of this branch is now 326. Papers were presented by J. W. Sylvester on "Certain Features of Underground Line Construction" and by Thomas Sproule on "Certain Features of Overhead Line Construction." The first paper dealt with conduits and their installation and manhole construction and covered the history of conduit construction in Philadelphia, embracing Edison tube, wooden conduit, vitrified-clay duct (single and multiway) and fiber duct. Slides showing many interesting examples of underground work were shown and demonstrations of rodding and the splicing of a 10,000-volt cable were given at the close of the meeting.

The second speaker confined himself to the subject of chestnut poles. He presented statistics relating to the pole consumption in the United States as well as the city. The pole industry was traced from the forest to line construction and the specifications governing the purchase of poles as well as the effect of rot and other troubles was treated upon. Many slides were shown illustrating the damage to pole lines by wind and sleet storms. An elaborate exhibit was arranged for both papers. An actual pole top fitted with overhead-line apparatus attracted much attention. Messrs. Goodwin, Silbert, Post, Adams, Hawkes, Montgomery, Penrose and Turner took part in the discussion. The attendance was 140.

The Accounting Department Branch meeting was held on April 8. The paper of the evening "Coal, from Mines to Ashes," was presented by J. H. Nickell, statistician of the Accounting Department.

New Electrical and Mechanical Appliances

Triumph-Monitor Reversing-Motor Drive for Planers.

Machine tools of various kinds have been driven by individual motors for many years, but where the tool is required to have a reciprocating motion, such as a planer, with different speeds on the cutting and return strokes, the difficulty has been heretofore in providing a successful system of direct drive; therefore, planers have usually been driven by belts. The advantages of direct connection are very marked, however, and these have led manufacturers to develop means of directly connecting a reversing motor to such machinery. As a result of a long series of studies and experiments the Triumph Electric Company, of Cincinnati, O., has developed a system of automatic planer control in connection with a variable-speed reversing motor for accomplishing direct connection with marked success and economy.

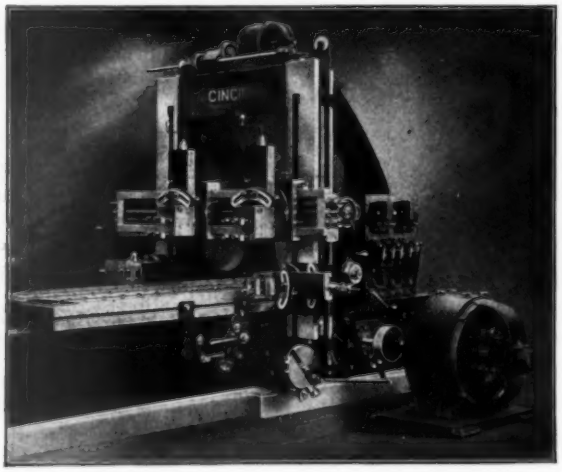


Fig. 1.—Reversing-Motor Drive Applied to Planer.

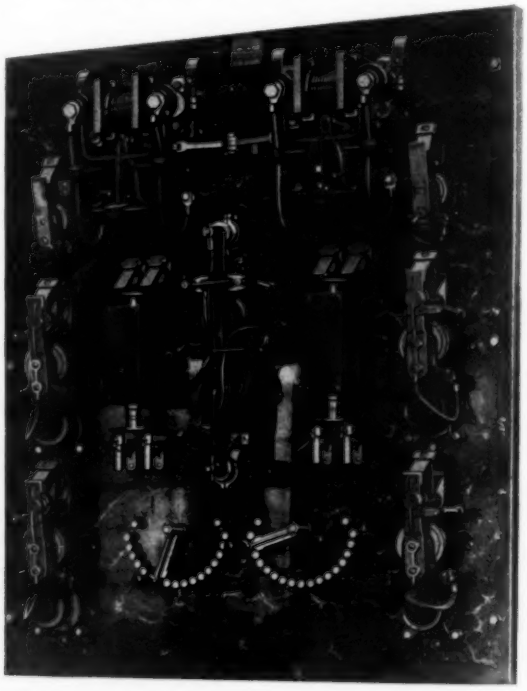


Fig. 2.—Triumph-Monitor Reversing Controller Panel.

This system differs from other attempts at solving this electrical problem in that, instead of providing for dynamic braking of the motor before applying the reversed power, it applies the reversed power directly after cutting off the current. It is claimed that this method has a number of advantages, among which are increased speed of reversal, greater uniformity in length of stroke, reduced reversal current rushes and decreased wear on both motor and control equipment.

In Fig. 1 is shown a large planer equipped with Triumph reversing motor and the Triumph-Monitor control equipment. The latter is mounted on a panel, a closer view of which is shown in Fig. 2. An inspection of the latter illustration shows that the control switches are duplicated on either side of the center of the panel, the central electromagnetic switch being the main circuit-breaker. On the left-hand side of the panel is provided the control equipment for governing the cutting stroke, whereas on the right-hand side is provided identically similar equipment for governing the return stroke. The dial-like contact sets near the bottom are the shunt-field rheostats, which can be adjusted through a wide range up to four times the return speed that is used on the cutting speed. Along the edge of the control panel are armature-resistance short-circuiting switches. Between these and the main circuit-breaker is a solenoid accelerating switch, and at the top is the main motor switch. Each of these switches is entirely automatic and is provided with arcing contacts which instantaneously break the current without destructive action on the switch. Between the two upper motor switches is an interlocking lever which prevents cutting and return switches from operating simultaneously.

The main driving motor for the planer is set at one side of the machine so that its vibration is not transmitted to the tools. The motor is a compound, commutating-pole, variable-speed machine, which drives the planer platen in either direction through gear trains. The main drive shaft of the planer is flexibly connected to the motor armature, thus reducing loss of power to a minimum. Before starting the planer a main switch directly below the control panel is closed, thus energizing the control apparatus, but this does not start the planer until a master switch, which is installed in place of the regular tumbler handle used on belt-driven machines, is turned to the starting position. The controller then automatically starts the motor and as the platen moves to the end of the desired stroke a stop is thrown over the tumblers which actuate the reversing switch that governs the action of the controller. The latter immediately cuts off the power and throws the reversed current onto the motor armature through the armature resistance. The planer can be stopped at

any point by throwing the master switch to the stop position. This stops the motor almost instantaneously, in fact, it is possible by throwing the master switch again to the start and immediately afterwards to the stop position to produce a movement of the platen of only one-half inch. The reversal at the ends of the stroke is so rapid and definite that the length of the strokes does not vary more than one-eighth inch on cuts of any length or at any speed.

Tests on this equipment have shown that it can reverse the planer much more rapidly than any equipment embodying dynamic braking. In Figs. 3 and 4 are shown graphically the results of a test made on a 46-inch by 30-foot Gray planer. In Fig. 3 is shown the record of a few strokes in which the reversed current inputs are shown on either side of the zero line. The motor used in this case was a 30-horsepower, 115-volt Triumph motor operating from 275 to 1,100 revolutions per minute. The material being cut was wrought iron. A five-eighth-inch depth of cut was made. The cross traverse feed was three-thirty-seconds inch and the cutting speed 46 feet per minute. Two tools were in operation on separate bars at the same time. Fig. 4 shows the same machine running idle, so that a comparison of these two diagrams shows the additional current input required for the cutting operation.

Among other points of superiority claimed for reversing-motor drive over the ordinary belt drive, are increased quantity and quality of finished product, flexibility, appearance, quietness and cleanliness. This type of drive is capable of transmitting much more power than the usual belt drive, and will remove more metal in a given time if the planer is designed to stand sufficiently heavy cuts. The finished work is said to be smoother and cleaner because of reduced vibration on the planer housings.

This type of reversing-motor drive is particularly adapted to planers above the 30 or 35-inch width, for which sizes it shows decidedly improved efficiency over any other method. For planers below these sizes the efficiency of the belt drive and the reversing-motor drive are about equal. The greatest advantages are shown on very heavy work. This type of drive is also being applied to vertical slotting machines and similar reciprocating tools with excellent results.

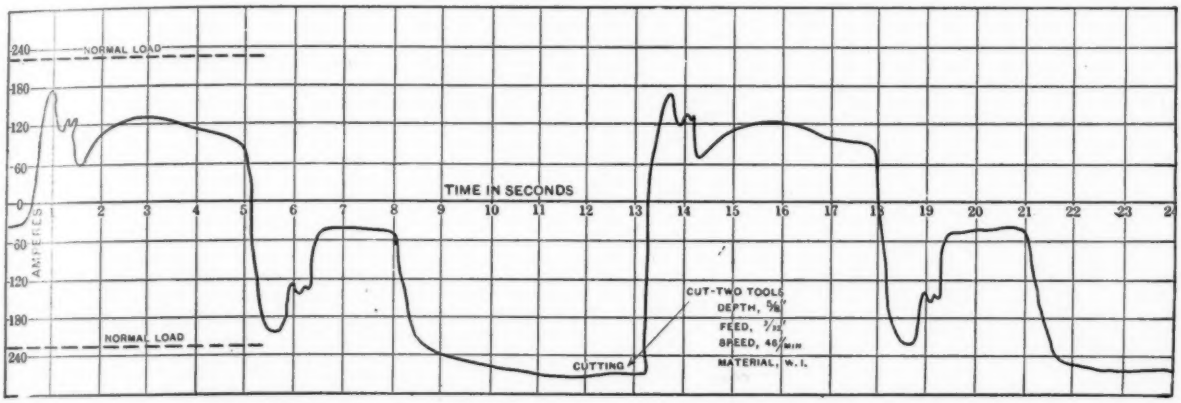


Fig. 3.—Oscillographic Test Record of Reversing-Motor Current Input on Large Planer.

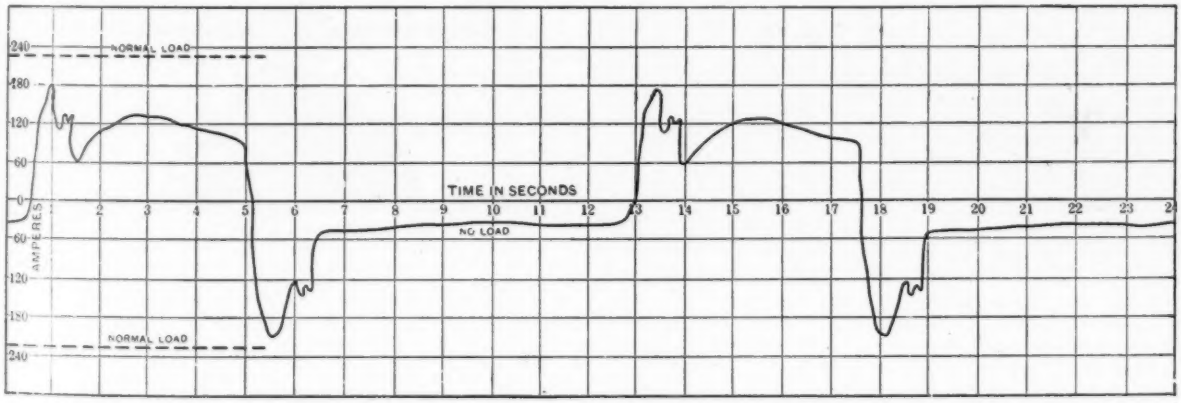


Fig. 4.—Record of Current Input for Same Planer Running Idle.

Little Damage to Cutler-Hammer Controllers from Flood at Goodyear Rubber Plant.

In 1909 the feat of the Cutler-Hammer lifting magnet that salvaged a boat load of wire fence and nails from the bottom of the Mississippi River was heralded all over the country, because this was the first actual demonstration of the waterproofness of lifting magnets. Water has again served to indicate the ruggedness of Cutler-Hammer products. In the plant of the Goodyear Tire & Rubber Company, Akron, O., the 15 multi-voltage calender controllers, three alternating-current control panels, two 500-horsepower multiple-switch starters and many miscellaneous types of Cutler-Hammer motor controllers were submerged for a considerable period during the recent Ohio floods. Water and mud, the latter particularly, had gotten into every crevice, some of the drum controllers being found completely filled with mud.

When the engineers and erecting men sent by the Cutler-Hammer Company arrived at the plant, the work of scraping out the mud and washing had been started and some of the controllers were in small sheds erected by the Goodyear Company which were used for drying pur-

poses, they being lined with steam pipes.

Upon testing the calender panels there was apparently a considerable ground but this proved to be due to the moisture in the grid-resistance insulation which was quickly dried out with blow torches and the panels were ready for use as soon as the calenders were ready to be driven. The Varley coils, with the exception of three, which were damaged in the handling, were entirely unaffected by the long submersion in water. The cement-covered resistance units also, with the exception of two broken in conveying to dry rooms, were not affected by the water. The entire equipment was put back in operation as soon as the machinery of the plant was ready and no trouble was experienced.

Lighting at Baltimore Show.

The artificial illumination used in connection with the Baltimore Automobile Show recently held in the Fifth Regiment Armory Building was one of the attractive features of this exhibit. The floor area of the armory is approximately 325 by 225 feet, and thus afforded favorable opportunities for spectacular and decorative lighting effects. The installation consisted of

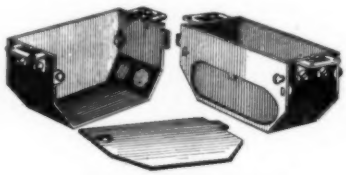
Mazda Lighting of Automobile Show.

1,100 100-watt, 1,300 25-watt, 250 40-watt and 100 60-watt Sterling Mazda lamps. An idea of the splendid illumination provided by these units can be gained from the accompanying illustration.

Adapti Sectional Steel Switch Boxes.

Wall switch boxes and receptacles must frequently be installed side by side in groups of several units. In order to secure proper alinement of the individual boxes a number of sectional switch boxes have been placed on the market; these permit the assembling of individual units into a gang box of any desired size and avoid the necessity of ordering special gang boxes to fit the conditions.

An ingenious switch box of this description has been placed on the market by the Adapti Manufacturing Company, Cleveland, O. This box is made of No. 14 U. S. gauge steel, as is required by the National Electrical Code. Its most distinctive feature is that it has but one removable side; this tends to increase the rigidity and strength of the box, a feature that makes a strong appeal to all interested in high-class construction. One side of the box is secured to the end wall by means of two rivets formed by a projection of the lugs of the material of which the box is made. The other side is removable and is secured at one end by the rectangular projection which engages with the perforated ear. The other end is fastened by means of a slotted head, which fits over the head of a screw threaded in the lug forming part of the second end wall. The method of assembling is such as to form the equivalent of a bayonet joint. Each end of the box is provided with adjustable ears for mounting the box; these ears are reversible for either old or new work.



Adapti Sectional Switch Box.

At the bottom of the box there are beveled corners provided with knockouts for use with flexible tubing. The knockout in the permanent side of the box is of such size that, when removed for assembling two or more unit boxes in a gang, it provides ample wireway between the switches. These boxes are made to fit any standard switch or plug receptacles. They are made in both 2-inch and 2.5-inch depths for circular-loom work, and in 3.5-inch depth for use with rigid or flexible metallic conduit. These boxes have been tested out for accurate spacing up to and including an 11-gang box, and have been found to be absolutely perfect in this regard.

New Large Outdoor Tungsten Fixture.

Tungsten outdoor fixtures having the usual 18-inch and 22-inch reflectors are used to a considerable extent, but where a number of lamps are clustered on one fixture, a larger reflector is desirable. For the new two, three and five-light fixture, put on the market by the Line Material Company, of South Milwaukee, Wis., a 26-inch radially fluted reflector is provided, which is claimed to be the largest of its kind that has been used for this purpose. There are various types of this so-called "Many Light" fixture made: for bracket suspension, mast-arm suspension, pulley and rope suspension and for span-wire suspension. One of these arranged for span suspension is shown in the accompanying illustration.

Swiveling at two points insures the hanging of the reflector in a horizontal plane, but by tightening the half-inch bolt above the reflector, the fixture can be made rigid, if desired.

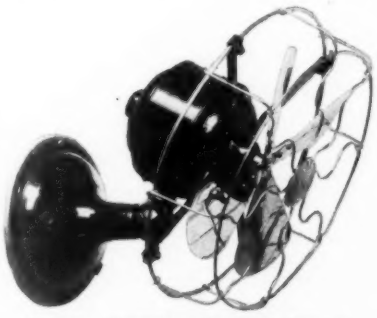
Outdoor Tungsten Cluster Fixture with Reflector.

The lamp sockets, reflectors and channel arm are supported by a high-voltage insulator, which is a new Kyle patented feature. This insulator, which protects the series-cutout sockets and other live parts from grounds or leakage of current, is so designed that even should it be broken the fixture will not be dropped. For the support of the line wires, a steel channel arm is provided which has the Hendee insulator tips.

A New Line of Diehl Fans With Pressed-Metal Body and Base.

Diehl pressed-metal fans as placed upon the market for the season of 1913 represent a distinct departure from former Diehl fan models in cast iron, presenting novel and well defined features of great value. The line is complete in both alternating and direct currents in the following sizes: 12 and 16-inch standard desk and bracket fans; 12 and 16-inch oscillating fans; 12-inch residence type, six blades; 12-inch residence type, oscillating, six blades; 8-inch residence type, four blades; 8-inch telephone-booth fans.

In general this new line is unique in its originality of design both from the viewpoints of utility and artistic harmony of proportion. The fan body is cylindrical, well balanced, and poised upon a stem of sufficient length to admit proper guard clearance, yet not so long as to be disproportionate. The stem is sufficiently large in diameter to harmonize with the general proportion of the fan body and the broad flat base. A pad of soft rubber slipped over the base and tightly clasping its flat edge serves to eliminate any vibration which might be caused by rapidly whirling blades and to obviate scratching of furniture.



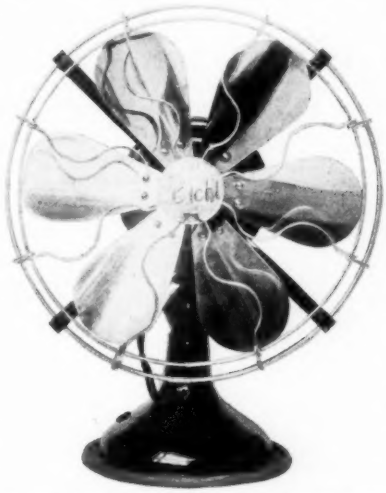
12-Inch Alternating-Current Fan in Bracket Position.

A swivel and hinge joint permits a forward tilting of the fan body as far as is practicable without guard interference and a backward adjustment to an angle of 90 degrees which converts the fan to bracket use, the base being drilled to admit screws. This joint is governed in the 12 and 16-inch sizes by a wing nut the wings of which are turned in toward the ball joint. All fans are adjusted horizontally upon a swivel with the exception of the oscillator which is mechanically rotated and naturally needs no horizontal adjustment.

Special machinery being employed in the manufacture of parts insures concentricity and replacement from stock, a very essential feature in fan manufacturing and one to be considered by the prospective buyer.

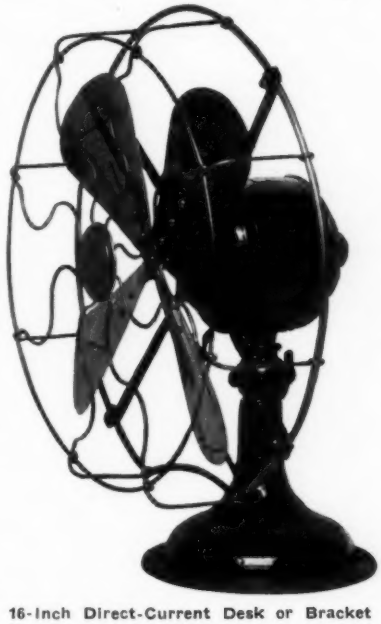
The pressed-metal form of fan construction minimizes weight to the last degree, while the whole fan is reinforced and strengthened to withstand the roughest usage.

All field frames of the pressed-metal line are composed of laminations contributing materially to electrical efficiency and reducing operative costs.



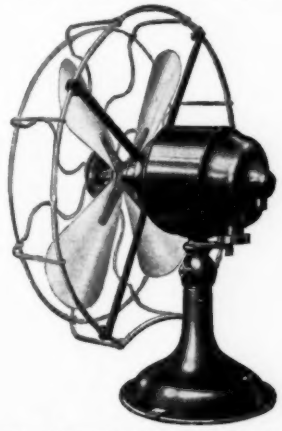
12-Inch Alternating-Current Residence Fan, with Six Blades.

The oscillating fans are unique in the fact that the oscillating mechanism is entirely concealed within the rear end cover. The horizontal overall dimensions of the fan body are shortened owing to the fact that the detachable worm which operates the oscillating mechanism is placed between the bearings instead of on an extension of shaft beyond the rear bearing. Another novel feature of the 1913 oscillator is the ease by which the arc of oscillation may be changed while the fan is in motion. A knurled-head screw at the bottom of the oscillating disk is turned by thumb and forefinger and regulates the arc of oscillation in four distinct steps from 90 degrees to zero, inclusive, at which point oscillation ceases. An automatic safety device has been adapted to the oscillating mechanism which causes oscillatory motion to cease temporarily if the fan body comes in contact with any obstruction which would tend to interfere with its swing. This device prevents grinding and breaking of gear teeth, injury to arm lever, etc. As soon as the obstruction is removed the fan at once picks up its oscillatory motion again.



16-Inch Direct-Current Desk or Bracket Fan.

It has been found in some instances that even the slight hum incident to rapidly revolving blades causes annoyance to nervous persons; especially is this true of the hospital and sick room, although at times a forced draft is both desirable and necessary. To overcome this objection a slow-speed six-blade fan, otherwise identical with the four-blade type, has been evolved and supplements the latter line in 12-inch sizes only, this size being determined as the most desirable for the use in hand. Regulators giving three distinct speeds, and a standard finish of black enamel give both distinction, adaptability, and utility to the 12 and 16-inch sizes for direct current and for alternating current of all frequencies.



16-Inch Alternating-Current Oscillating Fan.

Light-weight eight-inch residence-type four-blade fans have attained great popularity both from their extremely light weight, moderate air current, current economy, adaptability to the small room, and noiselessness of operation. The eight-inch residence-type fans are adjustable for desk or bracket use by the turn of a screw. They are finished in gun-metal throughout and present a dainty and pleasing appearance.

Telephone-booth fans hung on springs, which absorb the least possible

amount of vibratory noise, are similar to the eight-inch standard type with the exception of the substitution of a curved suspension rod for the usual stem.

Faries Holders for Semi-Indirect Lighting Bowls.

In the accompanying illustrations are shown a number of bowl holders made by the Faries Manufacturing Company, of Decatur, Ill. These are designed particularly for holding the ornamental glass bowls used for semi-indirect lighting fixtures. These holders are of two types. The first of these classes is represented by the two upper illustrations; in this type of holder the bowl does not have to be bored out, because the holder clamps onto the edge of the bowl but does not pass through the glass. In this case any number of holders can be provided for as many chains or other methods of hanging the bowl. The holder provides not only

Faries Bowl Holders for Semi-Indirect Lighting.

for fastening the chain, but also for supporting the lamp socket. The other type of holder, such as the four shown in the lower illustrations, is provided in each case with a threaded nipple. These nipples pass through holes that are bored in the glass at the edge of the bowl and therefore support the bowl and also provide a means for attaching the socket and lamps.

The designs shown are in each case one-third of the actual full size. In the case of those holders provided with nipples that pass through holes in the bowl, a lead, leather or other soft washer should be placed against the glass. The Faries Manufacturing Company also makes special styles of holders to accommodate different shapes and styles of bowls. These are all highly finished in any finish desired.

The E. S. B. Axle Train-Lighting System.

In our issue of April 19, 1913, mention was briefly made of the new axle-driven train-lighting system developed by the Electric Storage Battery Company, of Philadelphia, Pa., and the fact that the Atchison, Topeka & Santa Fe Railway Company had ordered 62 of these equipments after exhaustive tests thereof. Further particulars of this interesting and simple system are now at hand.

It will be recalled that this system operates as a constant-voltage system rather than as a constant-current system. Fig. 1 illustrates the *modus operandi*. The dynamo *A* is of the Rosenberg type used abroad very extensively for a number of years in axle lighting, but redesigned by the Electric Storage Battery Company to operate in connection with its constant-voltage regulator. Current in the primary field winding F^1 produces a small primary field flux represented by the arrow *P*, which induces a small electromotive force between the short-circuited brushes B^1 and a flow of current through the short-circuit connection *C*. This current, flowing through the armature winding, produces by armature reaction the secondary or principal field flux, which does not pass through the frame of the machine, but is confined to the heavy pole shoes and the armature as shown by the arrows *K*. This latter flux produces the electromotive force at the principal brushes B^2, which are connected to the external circuit, a series field winding F^2 in this circuit serving to balance the armature reaction due to load. An important advantage of this type of machine lies in the fact that it generates the same polarity with either direction of rotation, thus requiring no pole-changer.

The primary field winding F^1 is connected across opposite junction points of the Wheatstone bridge *W*, the other two junction points being connected respectively to the positive and negative terminals of the machine. This bridge is designed to give the constant-voltage characteristics above mentioned. It includes fixed resistances *X* in opposite branches and iron-wire ballasts *Y* in the other two branches. The latter, on account of their high temperature coefficient, have a practically constant-current characteristic under operating conditions. This combination of circuits produces a field excitation continually diminishing with increase of speed. The resulting speed-voltage characteristic of the dynamo is shown in Fig. 2.

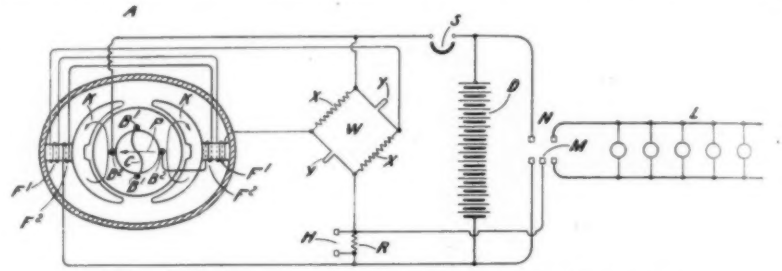


Fig. 1.—Circuit Arrangement of the E. S. B. Train-Lighting System.

An automatic switch *S* connects the dynamo to the battery *D* when the voltage of the former is slightly above that of the latter and opens when the output of the dynamo drops to zero. The knife switch *N* connects the lamp circuit *L* to the battery.

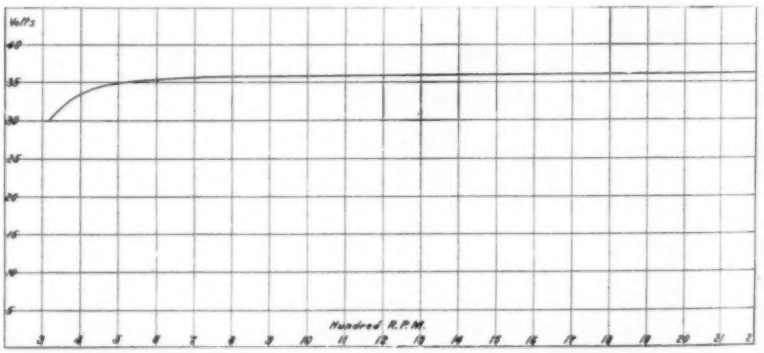


Fig. 2.—Test Curve Showing Constancy of Voltage Through Wide Range of Speed.

The voltage of the dynamo is fixed at a point slightly above the floating voltage of the cells, thus insuring that the battery is always fully charged. The difference between this voltage and that of the battery on discharge is, however, so small and the change from one to the other so gradual that no lamp regulator is required.

Should it ever be found necessary to

give the battery a high-voltage charge, this may be done during a daylight run by means of the fixed resistance *R*, normally short-circuited by the switch *H* and also by the clip *M* on the main lamp switch. When both of these switches are open, the voltage of the dynamo is raised by an amount determined by the value of the resistance *R*. Whenever lights are required, the closing of the lamp *N* short-circuits the resistance *R*, reducing the voltage to normal and eliminating the possibility of excessive voltage at the lamps. During five months of continuous operation of a demonstration equipment, no occasion for such a high-voltage charge has arisen.

This system automatically adjusts the output of the dynamo to the requirements of the service, and gives the battery the slight amount of overcharge required to keep it practically full and in good condition, but no more, thus producing conditions of operation ideal for maximum battery life. Should the battery become discharged by a prolonged stop with lamp load on, its charge will be rapidly restored during the subsequent run. Should the car be transferred from a daylight run to one requiring considerable artificial lighting, the output of the dynamo will increase to meet the changed conditions of service. This is all accomplished automatically without manual adjustment of any kind.

Among the advantages claimed for this system are the following: simplicity, requires no pole-changer nor lamp regulator; the dynamo regulator has no moving parts, no vibrating contacts, no dashpots, wearing parts, pivots, nor carbon piles—merely resistance units permanently connected in circuit; no manual adjustments are required; the battery is recharged rapidly after discharge; there can be no excessive overcharge of battery nor continuous discharge while standing; the cost of maintenance, repairs and inspection is reduced to a minimum whereas the battery life is prolonged to a maximum.

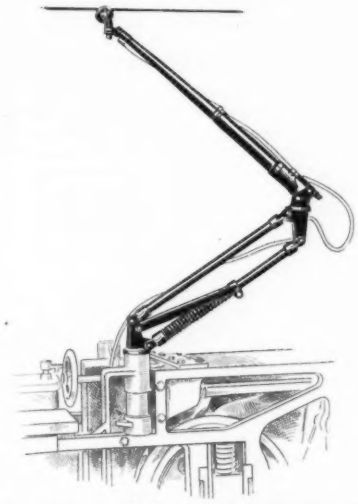
New Type of Mine Trolley.

As a result of the demand for a mine trolley differing from the standard lines, a new type shown in the accompanying illustrations has recently been placed on the market.

This particular trolley has several distinct advantages over existing types. Three very important features are as follows: (1) The variation in contact pressure for different trolley-wire heights is much less than that obtained by a standard single-pole trolley. (2) The short length of trolley pole permits turning around in narrow passages. (3) The trolley does not interfere with high trailing cars on sections where trolley wire is low.

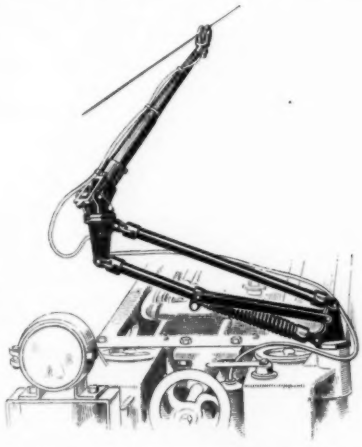
When the wire is at a height of five feet from the top of the rail, the trolley-wheel pressure is approximately 26 pounds, while at a height of eleven feet it is about 18 pounds. This shows a variation of eight pounds through a range of six feet, which is much less than can be obtained by a single-pole trolley.

With the standard single-pole trolley, where the wire hangs low and extreme



New Mine Trolley in Raised Position for Backward Operation.

contact pressure is exerted, the pole is often damaged when the wheel leaves the wire and strikes a roof or other obstruction. The new type trolley under these conditions, owing to the slight variation in pressure throughout the wide range in height, will be less liable to danger of breakage. This slight variation also makes it unnecessary to impose heavy pressures on low trolley wires, with the result that



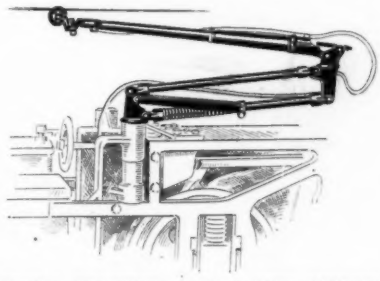
Operating with Wire on Opposite Side of Locomotive from Trolley Base.

the wear at the wheel and harp will be materially less than that caused by the single-pole trolley.

In coal mines where the condition of the roof or overhanging rock is such that narrow entries are necessary, it is often impossible to run one of the longer single-pole trolleys; whereas this new type of trolley can be turned around in passages from four to six feet in width, with the socket located approximately in the center of the locomotive.

Where fairly high cars are used and a wide variation in the height of the trolley wire occurs, trouble is often encountered with the single-pole trolley striking the car when the trolley wire is low, owing to the projection of the wheel over the car. The new trolley is designed especially to overcome this objection, as the entire operation of the trolley can be kept within a radius of four to six feet from the vertical line through the trolley socket. It the trolley wire changes in height and position over the track during the run, as is often the case in surface haulage, particularly in iron and copper mines, the trolley wheel can be made to follow the wire throughout a six-foot vertical change and a wide horizontal range without stopping the locomotive.

When the locomotive is used for gathering purposes, and where two single-pole trolleys are ordinarily required, one on



Trolley Operating on Low Wire Without Interfering with High Trailers.

each side of the locomotive, this new trolley can be used with the trolley socket located near the center of the locomotive toward the front end; the upper pole can be swung to operate satisfactorily on side of the locomotive, whether the trolley wire be on the cross-cut side of the entry or on the room side.

The trolley is designed to operate on a wire having a range in height of from 5 to 11 feet above the top of the rail, it being assumed that the locomotive trolley socket is about three feet above the rail. The trolley will operate successfully where the trolley wire may have a variation in its location from the center of the track on which the locomotive is running up to 4 feet to the right or left, without change of location on the locomotive itself.

The trolley consists of two members which operate in sockets. By means of a latch or pin at the lower socket, the lower member can be adjusted vertically and kept in a rigid position, and further, can be swung horizontally and fastened in any definite position required. This trolley is manufactured by the Westinghouse Electric & Manufacturing Company.

Latest Approved Fittings

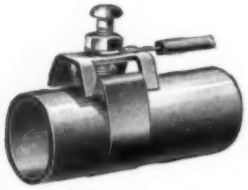
CABINETS.—The Flint Electric & Manufacturing Company, 1400-1412 Delgany Street, Denver, Colo.
Approved March 19, 1913.

FIXTURES.—H. E. Bullington, 305 North Graham Street, Richmond, Va.
Approved March 8, 1913.

FIXTURE PARTS.—National X-Ray Reflector Company, 235 West Jackson Street, Chicago, Ill.
"Nat'l X-Ray Ref. Co.," 660 watts, 250 volts.
Receptacles and reflector holders used in fixture construction.
Standard Edison base, catalog Nos. 8051-8055 inclusive.
Mogul base, catalog Nos. 8099-8103 inclusive.
Reflector holders, catalog Nos. 8000-8023 inclusive.
Approved March 18, 1913.

FIXTURE WIRE.—Habirshaw Wire Company, Yonkers, N. Y.
Marking: Three blue threads parallel in braid.
Approved February 27, 1913.

FLEXIBLE CORD.—Habirshaw Wire Company, Yonkers, N. Y.
Markings. Three blue threads parallel in braid.
Approved March 3, 1913.



Ground Clamp, Type A.—Cameron Appliance Company.

GROUND CLAMPS.—Linn B. Abbott, Fairfield Avenue, Bridgeport, Conn.
"Abbott" clamp. A copper-plated sheet-steel ground clamp for use with pipes from one-half to 3 inches in diameter.
Approved February 10, 1913.

GROUND CLAMPS.—Cameron Appliance Company, Everett, Mass.
"New York" ground clamp.
Type A, for signaling systems only. A soft copper strip with brass saddle piece and set screw.
For power circuits, Type B. A soft copper strip with brass saddle piece and set screw provided with a clamping lug.
Type C. A soft copper strip with a galvanized-iron saddle piece and brass set screw; also soldering lugs.
Type D. A soft-copper strip with brass saddle piece and set screw; also copper soldering lugs.
Approved March 18, 1913

The electric fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

INSULATING JOINTS.—The Macallen Company, Macallen and Foundry Streets, Boston, Mass.
Approved March 17, 1913.

Insulating Joint.—The Macallen Company.

INSULATING MATERIALS.—Johns-Pratt Company, Hartford, Conn.
H. W. Johns-Manville Company, sole agents, New York, N. Y.
"J. P. Bakelite."
This is a molded insulating material with high dielectric strength. It is not strictly non-combustible and, although somewhat brittle, has moderate mechanical strength. Its absorption of moisture is very small and it is affected little, if at all, by oils or acids. It is suitable for use where a material molded in shapes or flat pieces is desired for use in electrical appliances where it will not be exposed to high temperatures, and where a material having the properties indicated above is required for parts or bases of electrical appliances.
Approved March 10, 1913.

Ground Clamp, Type B.—Cameron Appliance Company.

INSULATING MATERIALS.—Johns-Pratt Company, Hartford, Conn.
"Vulcabeston 201."
This is a molded insulating material of fair mechanical and moderate dielectric strength. It is not exactly non-combustible and it is somewhat absorptive, but is little affected by oils or acids. It is suitable for use in electrical appliances where it will not be exposed to excessive temperatures and where a material having the properties indicated above is required for parts or bases of electrical appliances.
Approved March 8, 1913.

PICTURE MACHINES AND APPLIANCES.—The Premier Electric Company, Ravenswood Park, Chicago, Ill.
For Dietz Safety Magazine Company, Chicago, Ill.
A sheet-steel film magazine having a reel shaft combined with a spring and clutch in such a manner that the reel is prevented from turning when the door of the magazine is open or left unlatched.
So far as the practice of operating picture machines with open magazines is prevented by the use of this device, its utility is recognized.
Its efficiency in preventing fires in moving-picture equipments would appear to be uncertain, owing to the probability of causing broken films by carelessness in its use, thus requiring the trimming and cementing of the film or replacement of the reel, and unnecessarily introducing all of the inherent hazards of such manipulations.
In the opinion of the Laboratories the value of the automatic stop in preventing fires is nominal and directly correlated with the skill, care and cautiousness of the operator of the machine, such a device being unnecessary with a responsible attendant and liable to cause complications in the hands of a careless or unskilled operator.
Approved March 8, 1913.

Ground Clamp, Type D.—Cameron Appliance Company.

SWITCHES, Surface Snap.—The Trumbull Electric Switch Manufacturing Company, Plainville, Conn.
Approved February 25, 1913.

WIRES, Miscellaneous—Independent Lamp & Wire Company, 1733 Broadway, New York, and York, Pa.
Tests indicate that the coverings on this wire are not injured by the heat to which they are liable to be subjected on magnet coils.
Approved February 18, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

ELGIN, N. D.—An electric-light plant will be installed here. C.

CARSON, IOWA.—The light plant, destroyed by fire, will be rebuilt. C.

HUMBLE, TEX.—The municipal water and light plant which was recently destroyed by fire will be rebuilt. D.

MAYVILLE, N. D.—Plans for the new electric light plant have been received. Estimated cost of new plant, $20,000. C.

CARLINVILLE, ILL.—The Carlinville Utilities Company contemplates changing the street-lighting system in this city. Z.

DANIELSON, CONN.—Plans are being considered by the Burgesses for the installation of an ornamental lighting system.

LORIMER, IOWA.—A franchise for supplying electric current in this place has been approved by a popular vote of the people.

LONE ROCK, WIS.—Bonds in the amount of $5,000 have been voted for the purpose of constructing an electric light plant. C.

AKRON, O.—The Akron Electric Light & Power Company has been incorporated to the extent of $25,000, to operate in this city. N.

ALTO, TEX.—The Alto Light & Power Company has been incorporated with a capital stock of $10,000 by E. C. Bates, W. B. Bates and others.

HENDRICKS, MINN.—The Hendricks Lighting & Power Company is working on a plan to extend its system from here to Ivanhoe. C.

VIDALIA, GA.—Bonds for $25,000 have been voted for the erection of an electric light plants. Address Silas B. Meadows, mayor, for information.

ATHENS, O.—It has been announced by President Ellis that an appropriation of $15,000 has been made to equip an electric light plant for the university.

ST. BERNARD, LA.—The St. Bernard police jury has granted a franchise to the New Orleans Railway Company for the extension of the lighting system.

ELLENSBURG, WASH.—Ridgeway Electric Light & Power Association has been incorporated with a capital stock of $1,000 by J. E. Rege and F. G. Prater.

FLORENCE, S. D.—A movement is under way to install an up-to-date light and power system in Florence. Address the city clerk for particulars.

DES MOINES, IOWA.—A. Frisk, chief clerk in the Department of Streets, is promoting a "White Way" for the residence portion of West Des Moines.

LOS ANGELES, CAL.—An ornamental lighting system covering at least 33 miles of the city's streets is proposed. Address City Electrician R. H. Manahan for particulars.

CORDRIE, GA.—J. G. White & Company, of New York, have purchased the Citizens Electric Light & Power Company, and will improve and enlarge it at a cost of $25,000.

BLUFFTON. IND.—City engineer B. A. Batson is preparing plans and specifications for remodeling the municipal lighting system. Twenty thousand dollars will be expended.

PERRY, FLA.—The Douglas Electric Company, of New Orleans, La., will prepare specifications for an electric light plant to be established by the Taylor County Lumber Company.

HINCKLEY, ILL.—On May 19 bids will be received for electrically-driven centrifugal-pumping machinery and accessories. Address J. H. Bauder, village clerk, for information.

AKRON, O.—Petitions for the establishing of a great "White Way" were received from property owners on Mill and Market Streets. Address E. G. Bradbury, clerk, in regard to the matter.

NORTH ADAMS, MASS.—The Stanley Electric Company will break ground on May 15 for the erection of a monster plant for the manufacture of paper and insulating material. The plant will cost about $1,000,000.

ATWOOD, ILL.—The Village Board has granted a franchise to the Central Illinois Public Service Company to furnish light and power in the village. The company has also been given a contract to light the streets. Z.

BUTLER, TENN.—Walker Brothers, of this city, have organized the Butler Electric Company and propose to have a hydroelectric plant completed by June 15. D. R. Shearer, of Knoxville, Tenn., is the electrical engineer in charge.

WEST BADEN, IND.—West Baden Water, Light, Heat & Power Company has been incorporated with a capital stock of $75,000 to furnish water, light, heat and power. H. Ballard, N. Ballard and M. B. Ballard are the incorporators.

WEST LEBANON, IND.—The West Lebanon Electric Light, Heat & Power Company has been incorporated with a capital stock of $10,000. The directors are William A. Hunter, Frank Burge, Charles Amos, Ross Ringel and Ike Hall.

PEQUABUCK, CONN.—The Andrew Terry Company, of this city, is preparing to install a series of three-up-to-date power plants. The work of installing the power plants will be under the direct supervision of Engineer Carlton W. Buell.

DALLAS. TEX.—Plans for a unit power, light and heating plant, with sufficient capacity for the courthouse, the Dallas-Oak Cluff viaduct and the county jail, are being worked out under the supervision of Architect H. A. Overbeck.

GREELEY, COLO.—The Greeley Hydro Electric Company plans to expend $1,500,000 for the power end of a plan, which is designed secondarily to furnish water to irrigate 125,000 acres of land. D. A. Campbell is president of the company.

OSKALOOSA, IOWA.—By practically unanimous expression, Oskaloosa voters granted new operating franchises to street car, electric interurban, light, heat and power public utilities at a special election held, for a term of 25 years.

CHICAGO, ILL.—On May 15 bids will be received at the office of Sanitary District for furnishing a series of alternating-current inclosed flame-arc lamps. Address Thomas A. Smyth, president of the Board of Trustees, relative thereto.

SPRINGFIELD, ILL.—The Board of Local Improvements has voted to use three-lamp standards in the residence districts of the Fourth Street lighting system instead of one-lamp standards, as originally planned. Five-lamp standards will be used in the downtown district.

BROWNSVILLE, TEX.—Announcement of the appointment of F. H. Williams, of this city, to the position of superintendent of the Brownsville Municipal Water and light plant, was made here. Extensive repairs and additional machinery will be placed in the plant within a short time.

CLEAR LAKE, WIS.—E. J. Schneider, of Amery, who owns the power plant and dam at Little Falls, has entered into an agreement with the Amery Electric Light Company to furnish that town with light and power, and is also figuring with Deer Park citizens to install electric lights there. C.

PERRY, IOWA.—The people of DeSota and Van Meter voted recently to install electric-lighting systems, a franchise having been granted by each town to the Adell Mill Company. The latter will start construction work immediately and electricity will be furnished by the Adell plant. C.

ALTUS, OKLA.—The city of Altus has entered into a contract to extend its lines north to the town of Blair, eight miles, to furnish light, power and heat. Blair has abandoned the question of installing a plant of its own.

CUMBERLAND, MD.—G. E. Painter Company, 324 N. Charles Street, Baltimore, Md., has prepared plans and specifications for the electric light and power wiring in the power house, engine yards and roundhouse being built for the Western Maryland Railway Company here. This contract will be of a very large size. K.

SUNBURY, PA.—The Beacon Electric Company has been incorporated with a capital of $5,000, to operate in Clinton Township, Lycoming County. The Delaware Electric Company, to be active in all electric lighting and power enterprises in Delaware Township, Northumberland County, will also have offices at Sunbury. N.

NEODESHA, KANS.—James R. Cravats, of Chicago, and Havilah Beardsley, of Kansas City, electrical engineers, have been looking over the field in regard to a plan which the Arnold engineering interests, of Chicago, have for a large power plant in this vicinity to supply the cement mills and other power users in this part of Kansas with electric power.

LITTLE ROCK, ARK.—It is stated that the Dixie Power Company, of which Walker V. Powell, of this city, is president, is preparing for the construction of its proposed hydroelectric plant, which will be located on the White River, near Cotter, Ark., where 15,000 horsepower can be generated for transmission. John A. Laird, of St. Louis, Mo., is engineer for the company.

BALTIMORE, MD.—The city will provide special illumination for the Advertising Club and Eagles' conventions to be held in the near future. Light Superintendent McCuen will erect a court of honor or an illumination with a colonnade in front of the Fifth Regiment Armory for the Advertisers and one in front of the Maryland Theater for the Eagles.

CITRONELLE, ALA.—A 30-year franchise has been granted to Daniel E. Smith, Hubbard Parker and associates, for erecting, maintaining and operating an electric light and power plant. Construction work is scheduled to begin at once and the expected cost is $20,000. The corporation which will operate the property will be known as the Citronelle Light, Ice & Power Company.

WHITE HALL, ILL.—The Central Illinois Public Service Company will build transmission lines costing about $52,000 to take care of a contract to supply power for electrically-driven machinery at the factories of the White Hall Sewer Pipe & Tile Company and the Illinois Drain Tile Company and for the tramways system operated by the industries. The contract is said to be worth about $25,000 a year. Z.

KANSAS CITY, MO.—The Metropolitan power plant at Ninth Street and the Blue River, dismantled two years ago, is to be remodeled by the company and converted into a lighting substation. Work will be started immediately. Machinery to the value of $50,000 will be installed. Louis H. Egan, general manager of the Kansas City Electric Light Company, may be addressed in regard to the matter.

WILMINGTON, DEL.—A resolution is pending to allow the Wilmington & Philadelphia Transit Company to erect poles and string properly insulated wires for the purpose of conducting electric current along the public road from Wilmington to New Castle. It is expected that the resolution will be adopted as it has been found impracticable to maintain electric plants in certain of the cities which could be supplied from Wilmington.

GOSHEN, IND.—Bids will be received May 19 for furnishing material and labor for constructing an electric-light system here. Separate bids are required for installing a 250-kilovolt ampere generator, switchboard, arc regulators, lamps and all electrical equipment, for furnishing and installing engine condenser and piping, for furnishing and installing all material and equipment necessary for an ornamental lighting system. Address S. F. Spohn, mayor, for desired information.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

NORWAY, S. C.—The Norway Telephone Company has been incorporated. C. T. Dowling is president.

OELWEIN, IOWA—The Corn Belt Telephone Company plans to rebuild its present plant and make other improvements this summer. C.

SEATTLE, WASH.—Universal High Power Telephone Company has been incorporated with a capital stock of $1,000,000 by R. H. Singleton, E. E. Lutz and others.

CONWAY, S. C.—The Conway Telephone Company is planning to issue $10.000 in bonds to extend lines and improve the equipment. R. B. Scarborough is president of the company.

HILLSBORO, IND.—Merchants & Farmers Telephone Company has been incorporated with a capital stock of $10,000 to operate telephone lines by J. B. Short, W. M. Lyon and J. D. Linville.

NASHVILLE, TENN.—Dowelltown Home Telephone Company has been incorporated with a capital stock of $4,000 by H. L. Anderson, E. C. Coggin, W. P. Smith, W. J. Avant and A. H. Robinson.

GARRETSON, S. D.—The Garretson Telephone Company has been incorporated with a capital stock of $10,000 by Frank Locke, Alfred Engleson, Louis Stensland, B. T. Hackenstand and others, of this city.

CUBA CITY, WIS.—The Cuba City Telephone Exchange Company has been incorporated with a capital stock of $2,025 by Henry Winn, W. H. Wilkey, James Jeffrey, F. A. Flomer, J. E. Kinney and A. B. Mankvill.

SAINT JOHN, KANS.—Rose Valley Mutual Telephone Company has been incorporated with a capital stock of $3,000 by W. W. Adams, J. W. Sharp, G. E. McCandless, G. A. Snyder, R. W. Goodman, all of Saint John.

HOUSTON, TEX.—Austwell Telephone Company has been incorporated with a capital stock of $7,000 for the purpose of constructing and maintaining a telephone line in Refugio, Calhoun and Victoria Counties. The incorporators are P. R. Austin, T. H. Taylor and J. T. Linebaugh.

WALA WALA, WASH.—C. E. Hickman, of Spokane, district commercial superintendent to the Pacific Telephone & Telegraph Company, is authority for the statement that $11,070 will be expended in the construction of underground toll lines in this city during the coming season. Additional offices will be built and new equipment added. O.

OROFINO, IDAHO.—Sampson Snyder, manager of the Orofino Telephone System, is authority for the statement that the work of rebuilding the line from this city to Kendrick, a distance of 35 miles, will be begun at once, and completed during the summer. The ground wires will be replaced by a metallic circuit and new poles will be substituted for those now in use. O.

PIERRE, S. D.—The Spirit Mound Telephone Company has been incorporated with a capital stock of $4,000 to to build a telephone line from Pleasant Valley Township to the town of Vermillion, a distance of 16 miles. The directors are Peter C. Clelaid, Thomas Jones, A. C. McDonald, H. N. Cleland, S. M. Simonson, Christian Nelso and D. M. Eldridge, all of Vermillion.

ELECTRIC RAILWAYS.

(Special Correspondence.)

RICHMOND, CAL.—The Oakland Traction Company is contemplating the extension of its San Pablo line west on Market Street.

NYACK, N. Y.—Mayor Kilby is at the head of a project here to build a new trolley line to accommodate Nyack and several adjacent villages.

REDWOOD, CAL.—The Redwood City Harbor Company will construct an electric road here at a cost of $200,000. George A. Merrill is president of the company.

PORTLAND, ORE.—The Portland Railway, Light & Power Company will electrify its line between Gresham and Bull Run, a distance of 12 miles. C. J. Franklin is superintendent.

SAN BERNARDINO, CAL.—The Pacific Electric Company has secured clear deed to right of way for a line through to Rialto, and construction work will begin immediately.

MADISON, WIS.—The Milwaukee Traction Company has filed articles of incorporation with a capitalization of $10,000. The incorporators are L. F. Wagner, N. C. Schulz and H. A. Schmidt.

HARRISBURG, PA.—The Moshannon Central Railroad Company, a company organized for the purpose of constructing and operating a five-mile electric railroad in Rush Township, has a capital of $50,000. N.

CHATTANOGGA, TENN.—It is stated that the trolley line from Chattanooga to Cleveland is to be a reality. The new enterprise is being engineered by J. W. Adams, who promoted the Ocoee River hydroelectric power plant.

CEDAR RAPIDS, IOWA.—The Cedar Rapids and Iowa City Railway Company is considering plans for the construction of an electric railway from Cedar Rapids to Mt. Vernon. J. D. Wardle is superintendent.

NEWBERN, N. C.—The Newbern Ghent Street Railway Company has announced that it will extend the car line from Newbern to Trenton and also to Pollocksville. The company uses Edison storage-battery cars.

ST. PETERSBURG, FLA.—Residents of this city have raised $22,000 for the construction of several miles of trolley line, extending from Bayboro to Lewiston. Work is to be started at once and the line is to be in operation by November 1.

VINITA, OKLA.—The Vinita Interurban Railway Company has been chartered with a capital stock of $10,000 to build an Interurban line from Vinita to the Eastern Hospital for the Insane. J. T. Radcliffe, M. F. Knight, of Vinita, are the incorporators.

FAIRVIEW, PA.—There is a movement on foot to build a street-car line from West Shamokin to Fairview and Ferndale. It is proposed to incorporate a company, to be known as the Ferndale & Fairview Street Railway Company and capitalized at $25,000, to build this line.

FORT WAYNE, IND.—Officials of the Fort Wayne & Northern Indiana Traction Company are preparing for the summer track work, and the announcement was made that new tracks will be laid on Wallace Street and on Broadway from Scott Avenue to the end of the line.

BERKELEY SPRINGS, W. VA.—

Since the Cacapon Power Company has sold its franchises to the Washington & Winchester Electric Company, the project to construct an electric railway from Berkeley Springs to Winchester and Hagerstown has been revived. Announcement has been made of a survey from the Potomac River to Winchester.

APPALACHIA, VA.—The Trackless Trolley Company of the South has been organized at this city. It is proposed to establish a trolley system of cars to be operated over the new stone roads in Wise County. The company has taken over the patent rights to use the trackless trolley cars in Virginia, West Virginia, Eastern Kentucky and East Tennessee.

SAN BENITO, TEX.—It is authoritatively announced that the San Benito & Rio Grande Valley Interurban Railroad will soon begin the construction of the extension of its line from Alton to San Antonio, a distance of about 250 miles. It has also arranged to extend another line of its system from a point near San Benito to Point Isabel, about 25 miles. D.

HOUSTON, TEX.—F. E. Ebersole has taken over the franchises and rights of way formerly owned by A. F. Irwin for the construction of a street-car line from Houston, through South Houston and Laporte, to the Bay Shore and work will probably be started in July or August of this year. The new line will be about 27 miles long and the cost of construction is estimated at between $800,000 and $900,000.

TEXARKANA, TEX.—The project of building an interurban line between Texarkana and Clarkville is now taking definite form. F. W. Offenhauser and associates have been granted the right of way on the Texas side of the town and a committee has been appointed to secure the right of way between here and Clarksville. The length of the line will be 65 miles and it is estimated that $100,000 will be necessary to build it.

OGDEN, UTAH.—The Ogden, Lewiston & Northern Railroad Company has filed articles of incorporation with $100,000 capitalization. It is announced that an electric railroad will be built to connect Preston, Idaho, and Ogden, Utah. The right of way has been determined upon, franchises secured and surveys made. The incorporators of the new company ate Fred W. Crockett, of Logan; A. L. Hyer, M. Pond, T. S. Karren, B. Pond and George E. Telford, of Lewiston, and others.

ARTESIA, N. M.—It is authoritatively announced that the General Electric Company has taken over the proposition of constructing an interurban electric line between Artesia and Cloudcroft, 125 miles. W. Morgan Hand, representative of the company at Kansas City, Mo., will soon make a reconnoissance of the route of the proposed line and upon his report the question of its construction will be determined, it is stated. It is planned to erect a hydroelectric plant at the falls on the Penasco River and to operate the road by means of this power. The route under consideration runs from Artesia to Hope, thence to Elk, thence through the James Canyon to Cloudcroft. Besides traversing a route of great scenic beauty it will afford a transportation outlet for a territory that is now without such facilities.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Foreign and Domestic Commerce, Washington, D. C., and refer to the file number noted.)

NO. 10,859. ELECTRIC-LIGHTING ACCESSORIES.—A report from an American consular officer in the Far East states that a manufacturer's agent in his district desires to establish connections with American manufacturers of wall plugs, switches, ceiling roses, and all kinds of electric lighting accessories.

NO. 10845. ELECTRICAL MACHINERY.—To supply the demand for metallic sodium and sodium superoxide, a factory for their manufacture is soon to be built in a European country. The company has a capital of about $95,000 and will be under the management of an engineer. Electric power will be used. American manufacturers of machinery would do well to write the company mentioned in the report. Communications may be in English, though Norwegian is preferred.

PROPOSALS.

MOTOR SURVEY CRUISERS.—Sealed proposals will be received at the United States Engineer Office, Norfolk, Va., until June 2 for constructing and delivering three motor survey cruisers. For further information apply to E. Eveleth Winslow, lieutenant colonel, engineers.

CONDUITS AND WIRING.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until May 26 for a conduit and wiring system in the marine hospital at Cairo, Ill., in accordance with drawings and specifications, copies of which may be obtained from the Supervising Architect or the custodian of the site.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until May 26 for alterations in the lighting fixtures in the post office at Manchester, N. H., in accordance with plans and specifications, copies of which may be obtained from the Supervising Architect or the custodian of the site.

ELECTRIC WIRING.—Sealed proposals in triplicate will be received by the Constructing Quartermaster, Fort Huachuca, Ariz., until May 23 for the electric wiring in connection with additions to certain buildings. Plans and specifications may also be examined at the offices of the Chief Quartermasters at San Francisco, Chicago, Fort Sam Houston, and the Constructing Quartermaster at Leavenworth. A deposit of $10 is required to insure return of plans and specifications. For further information apply to John A. Wagner, constructing quartermaster.

ELECTRIC CONDUIT AND WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until June 11 for the electric conduit and wiring and interior lighting fixtures of a two-story building for the post office at Hickory, N. C.; until June 16 of a one-story building for the post office at Rochelle, Ill.; until June 17 of a one-story building for the post office at Cynthiana, Ky. Drawings and specifications may be obtained from the office of the Supervising Architect or the custodians of the sites.

NEW INCORPORATIONS.

HARRISBURG, PA.—The Pennsylvania Keystone Electric Company has been incorporated with a capital stock of $10,000.

SPOKANE, WASH. — Orchard Homes Water & Light Company has been incorporated with a capital stock of $9,000 by L. B. Howard and William Sill.

SCRANTON, IOWA—The Scranton-Gidden Electric Company has been incorporated with a capital stock of $10,000. A. Moorhouse is president of the company. C.

NEW YORK, N. Y.—Abbey Electric Supply Company, Incorporated, has been incorporated with a capital stock of $3,000 by Alfred R. M. Diggles, Ambrose C. Leonard and Harry W. Gardiner.

ROCHESTER, N. Y.—Danz-Bowen Company, Incorporated, has been incorporated with a capital stock of $5,000 by William J. Danz and W. R. Bruce, Rochester; and Roy E. Bowen, Avon.

MOMENCE, ILL.—The Momence Utilities Company has been incorporated with a capital stock of $1,000 to operate heat, light and power plants. The incorporators are Howard F. Walker, Harry Exline and Byron Harpole. Z.

INDIANAPOLIS, IND.—The West Indiana Utilities Company has been incorporated with a capital stock of $200,000, and is a consolidation of the West Terre Haute Light & Power Company and the West Indiana Utilities Company.

KINGS PARK, N. Y.—Ashmunsen Manufacturing Company, Incorporated, has been incorporated with a capital stock of $100,000 for the purpose of manufacturing electrical machinery. The incorporators are J. Judson Dean, John O. Butterly and Christian Ashmunsen.

NEW YORK, N. Y.—Welding Materials Company, Incorporated, has been incorporated with a capital stock of $500 to manufacture and deal in electric welding apparatus, materials, etc. The incorporators are George Hills, David G. George and A. Jocelyn H. Magrath.

OKLAHOMA CITY, OKLA.—An Oklahoma charter has been issued to the Twin City Ice, Light & Power Company of Chant, with $5,000 capital. The incorporators are W. W. Beesley, Jr., of Bokoshe; J. M. Beesley, B. A. Little and J. N. Taylor, all of Chant.

BOISE, IDAHO.—The Owyhee Irrigation Power Company has been incorporated with a capital stock of $10,000 by Ruby Snow, W. G. Grace, John J. Blake and others, for the purpose of buying, selling and transmitting electrical energy for light, heat and all other lawful purposes.

NEW YORK, N. Y.—The Williams Electric Medical Battery Company, Incorporated, has been incorporated with a capital stock of $2,000 to manufacture medical batteries and other electrical apparatus. The incorporators are Louis F. Kuntz, Edgar L. Ostendorf and William W. Northrup.

PITTSBURGH, PA.—The Pittsburgh Electric Furnace Company is a new company which will build a plant in the Homewood district of the city for the reduction of precious ores by electricity. J. Rogers Flannery, of the Industrial Development Commission, is president of the company; Raymond S. Wile, vice-president; and Charles B. Ailesworth, secretary-treasurer. The Board of Directors consists of the officers, J. C. Gray and J. J. Flannery.

FINANCIAL NOTES.

One of the largest consolidations of public utilities' operations yet accomplished has just been arranged by E. W. Clark & Company, Philadelphia, Pa., through a merger of properties in Ohio, Indiana, Illinois and Wisconsin, with others in Michigan, under the corporate control of the Commonwealth Power, Railway & Light Company. In the deal there will be issued, largely in pursuance of existing stock of the companies to be merged, $26,500,000 of new securities. The capitalization of the Commonwealth becomes $39,000,000 and $7,125,000 of new cash is obtained to pay off temporary obligations incurred in property development. The new company will control 889 miles of electric railway, steam and water generating plants with 161,000 kilowatts capacity, and gas properties now furnishing about 1,925,000,000 cubic feet of gas a year. The controlled electric railway, lighting and power utilities and the gas works serve a population of about 950,000 in 78 cities and towns.

The Central Illinois Light Company, capitalized at $7,500,000, took over the Peoria Gas & Electric and nineteen other electric light and power companies surrounding Peoria. Commonwealth Edison may acquire control of new corporation.

A special meeting of the stockholders of the Commonwealth Power, Railway & Light Company will be held in Portland, Me., on May 15 for the purpose of authorizing an increase in the capital stock of the company and to ratify a contract providing for the purchase by the company of stocks representing the control of the Union Railway, Gas & Electric Company, the Springfield (O.) Light Company and the Michigan Railways Company and the payment to the company of $7,125,000 in cash in consideration of $7,500,000 six-per-cent five-year convertible bonds of the company, $10,000,000 preferred stock and $9,000,000 common stock.

Dividends.

Interborough Rapid Transit Company; an extra dividend of two per cent, payable to stock of record at the beginning of business May 15.

Portland Railway, Light & Power Company; a quarterly dividend of $1.25 per share, payable June 2 to stock of record May 10.

Tennessee Eastern Electric Company; a quarterly preferred dividend of 1.5 per cent, payable June 1 to stock of record May 20.

United States Telephone Company; a quarterly preferred dividend of 1.5 per cent, payable May 15 to stock of record April 30.

Reports of Earnings.

ELECTRIC BOND AND SHARE COMPANY.

The comparative reports of the Scranton Electric Company, subsidiaries of the Electric Bond and Share Company, for March and the twelve months ended March 31. 1913, as follows:

SCRANTON ELECTRIC COMPANY.

Month of March—	1913	1912
Gross earnings	$ 86,706	$ 68,249
Net earnings	57,088	37,194
Surplus after charges	43,037	25,314
April 1-March 31—		
Gross earnings	830,518	751,969
Net earnings	485,862	424,010
Surplus after charges	329,227	284,369

WHEELING ELECTRIC COMPANY.

Month of March—	1913	1912
Gross earnings	$ 25,011	$ 20,617
Net earnings	11,543	8,065
Surplus after charges	5,775	1,026
April 1-March 31—		
Gross earnings	270,999	229,642
Net earnings	124,107	116,893
Surplus after charges	61,439	75,272

E. W. CLARK & COMPANY PROPERTIES.

E. W. Clark & Company report earnings of the following properties for February, 1913, and the twelve months ended Feb. 28, 1913:

COMMONWEALTH POWER RAILWAY & LIGHT.

	1913	1912
February gross	$ 549,665	$ 488,859
Net after taxes	254,577	203,473
Surplus after charges	112,250	95,232
Twelve months gross	6,532,924	5,647,600
Net after taxes	2,769,963	2,389,949
Surplus after charges	1,211,462	1,089,549
Preferred dividends	360,000	360,000
Balance	851,462	729,549

Balance for common stock was equal to 7.1 per cent on outstanding issue of $12,000,000.

UNION RAILWAY GAS & ELECTRIC.

	1913	1912
February gross	$ 383,132	$ 293,554
Net after taxes	168,297	116,000
Surplus after charges	71,216	50,436
Twelve months gross	4,187,750	3,269,318
Net after taxes	1,770,164	1,388,275
Surplus after charges	746,794	631,779
Preferred dividends	314,975	314,600
Balance	431,819	317,179

Balance for $6,000,000 common stock was equal to 7.2 per cent on the outstanding issue.

CONSUMERS POWER COMPANY OF MICHIGAN.

	1913	1912
February gross	$ 265,840	$ 226,494
Net after taxes	139,288	107,560
Surplus after charges	73,104	67,304
Twelve months gross	2,862,798	2,429,168
Net after taxes	1,341,390	1,144,478
Surplus after charges	686,573	630,026
Preferred dividends	270,000	232,500
Balance	416,573	397,526

GRAND RAPIDS RAILWAY COMPANY.

	1913	1912
February gross	$ 93,049	$ 91,627
Net after taxes	37,002	37,628
Surplus after charges	22,181	22,901
Twelve months gross	1,241,548	1,184,564
Net after taxes	534,576	515,350
Surplus after charges	359,311	336,668
Preferred dividends	75,000	75,000
Balance	284,311	261,668

LEWISTON, AUGUSTA & WATERVILLE STREET RAILWAY.

	1913	1912
February gross	$ 41,349	$ 37,213
Net after taxes	10,571	5,859
Deficit after charges	3,914	8,584
Twelve months gross	631,259	590,320
Net after taxes	242,589	222,988
Surplus after charges	69,443	54,079
Preferred dividends	36,000	36,000
Balance	33,443	18,079

PORTLAND (ME.) RAILWAY COMPANY.

	1913	1912
February gross	$ 64,487	$ 62,100
Net after taxes	8,823	5,390
Deficit after charges	1,451	4,848
Twelve months gross	991,339	961,039
Net after taxes	294,485	240,333
Surplus after charges	171,236	127,123

Surplus charges is equal to 8.6 per cent on the capital stock outstanding.

NEW ORLEANS RAILWAY.

The report of the New Orleans Railway & Light Company for the year ended December 31, 1912, shows net earnings of $3,207,791, against $2,915,813 in 1911. The balance available for dividends was $995,033, which, after allowing for 5 per cent on the preferred stock, was equal to 2.47 per cent on the common, as compared with 1.35 per cent earned the previous year. The income account compares as follows:

Operating Revenue—	1912.	1911.
Railroad department	$4,295,027	$4,179,872
Electrical department	1,244,042	1,182,497
Gas department	1,089,078	973,092
Total operating rev	$6,628,147	$6,335,462
Operating Expenses—		
Railroad department	$2,450,917	$2,478,745
Electrical department	551,915	566,254
Gas department	417,524	374,650
Total opera'g expenes	$3,420,356	$3,419,649
Net operating revenue	3,207,791	2,915,813
Taxes	565,991	540,530
Operating income	2,652,264	2,375,283
Other income	41,573	44,157
Total income	2,683,374	2,419,440
Interest, reserve, etc	1,688,341	1,647,744
Surplus	995,033	771,696
Dividends	799,690	499,750
Surplus	195,343	271,946

NEW ORLEANS & RAILWAY LIGHT.

The report of the New Orleans Railway & Light Company for the three months ended March 31, 1913, compares as follows:

	1913	1912
Gross	$1,777,637	$1,730,711
Net after taxes	734,494	730,142
Surplus after charges	306,463	317,012

MEXICAN TELEPHONE & TELEGRAPH.

The report of the Mexican Telephone & Telegraph Company for the twelve months ended February 28, 1913, compared as follows:

	1913	1912
Gross	$716,742	$637,069
Expenses	332,133	314,452
Net	384,609	322,616

FEDERAL LIGHT & TRACTION.

The Federal Light & Traction Company reports as follows for February and two months ended February 28:

	1913	1912
February gross	$206,460	$175,734
Net	93,289	78,273
Two months' gross	424,706	365,645
Net	190,981	164,755

INTERBOROUGH RAPID TRANSIT COMPANY.

The Interborough Rapid Transit Company reports as follows for March and the nine months ending March 31:

	1913.	1912.
March gross	$2,958,105	$2,859,255
Net after taxes	1,618,178	1,545,736
Other income	46,424	32,914
Total income	1,664,602	1,578,650
Surplus after charges	738,808	654,306
Nine months gross	24,198,879	23,180,396
Net after taxes	12,715,199	11,943,605
Other income	316,915	283,279
Total income	13,032,114	12,226,884
Surplus after charges	4,757,302	3,978,427
Passengers carried nine months	472,204,293	450,450,367

AURORA, ELGIN & CHICAGO.

	1913	1912
March gross	$ 141,502	$ 133,523
Net after taxes	49,470	49,999
Surplus after charges	17,128	18,029
Nine months' gross	1,455,949	1,362,825
Net after taxes	595,705	561,399
Surplus after charges	306,378	276,333

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 5	Apr. 28
American Tel. & Tel. (New York)	128	129¼
Commonwealth Edison (Chicago)	132	130
Edison Electric Illuminating (Boston)	269	274
Electric Storage Battery common (Philadelphia)	47¾	48½
Electric Storage Battery preferred (Philadelphia)	47¾	48½
General Electric (New York)	138	138
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	1¾	1½
Massachusetts Electric common (Boston)	16⅛	*18½
Massachusetts Electric preferred stamped (Boston)	72½	75½
National Carbon common (Chicago)	116	116
National Carbon preferred (Chicago)	115	115
New England Telephone (Boston)	140½	142
Philadelphia Electric (Philadelphia)	22¼	22¼
Postal Telegraph and Cables common (New York)	82	82
Postal Telegraph and Cables preferred (New York)	67	67
Western Union (New York)	65	65½
Westinghouse common (New York)	61½	62¼
Westinghouse preferred (New York)	100	115

*Last price quoted.

NEW PUBLICATIONS.

ELECTROCHEMICAL INDEX.—The American Electrochemical Society has published a general index of the first 20 volumes of its *Transactions*, covering the period from 1902 to 1911, inclusive.

PACINOTTI'S MACHINE.—The Associazione Elettrotecnica Italiana has reprinted in a memorial volume the description of Antonio Pacinotti's electromagnetic machine, which was first published in *Nuovo Cimento* for June, 1864, appearing May 3, 1865. The reprint appears in five languages: Italian, French, English, German and Latin. The English translation has been made by S. P. Thompson. The volume contains a portrait of Dr. Pacinotti as a frontispiece.

LIFE TESTS OF INCANDESCENT LAMPS.—Report No. 13 of the Third Section of the Electrotechnical Laboratory at Tokio, Japan, is entitled "Life Test and Economical Study of Incandescent Lamps," by T. Hirobe and R. Mitsuda. The report covers tests upon carbon, tantalum and pressed tungsten lamps of Japanese, American and German make. The problem has been studied both mathematically and experimentally, and a large number of tables and curves show the results.

PUBLIC SERVICE REVIEW.—The Fourth Annual Public Service Corporation Review, published by the *Financial World*, New York, was issued Saturday, April 26. This is presented as a special supplement to the *Financial World* and reviews the operations of more than 1,100 public-service corporations in the United States, Canada and Mexico. The review is intended as a useful and quick reference work to bring within reach of investors, bankers and investment houses statistical information regarding the financial standing and operating position or efficiency of public-service corporations.

PERSONAL MENTION.

A. F. NEALE, for a number of years prominent in the electric automobile business in Boston, has joined the staff of the J. W. Bowman Company, handling the Waverley electric in Boston. Mr. Neale will be on the sales force of the Waverley department.

RALPH W. E. DONGES, Camden, N. J., has been elected president of the Board of Public Utility Commissioners at a special meeting May 1. Mr. Donges became a member of the Board at this time, having been recently appointed to office succeeding ROBERT WILLIAMS, of Paterson, whose term expired on that date. Mr. Williams was formerly president of the Board. ALFRED N. BARBER was re-elected secretary of the Board, and FRANK H. SOMMER, Newark, was again chosen counsel for the Board.

T. N. CARVER has been given a leave of absence from the chair of political economy and general economics at Harvard University, to accept the position of chief of the Bureau of Rural Economics, Department of Agriculture, Washington, D. C. Professor Carver is desirous of getting in touch with publications, records, blue prints and conclusions relating to information with regard to the scientific investigation of the work of the department. He is particularly interested in applied electricity in agriculture and will welcome information along these lines.

W. R. SWEANY, until recently acting general manager of the Toronto Hydro-Electric System, has been appointed sales manager of the Toronto Electric Light Company, Limited, effective May 1. Mr. Sweany succeeds Parker H. Kemble, who not long since, became general sales manager of the Union Gas & Electric Company, Cincinnati. Mr. Sweany was

W. R. Sweany.

for many years connected with the Stone & Webster properties and for about four years with the Georgia Railway & Electric Company, Atlanta, Ga. About four years ago Mr. Sweany became business manager for the Toronto Hydro-Electric System and has been with the System since the construction period. He designed the present street lighting system of Toronto. On June 1, 1912, Mr. Sweany was made acting general manager of the Toronto Hydro-Electric System.

E. W. ROCKAFELLOW has been appointed assistant general sales manager of the Western Electric Company in charge of the general sales. Mr. Rockafellow has been with the Western Electric Company since 1884, entering the service of the house as an office boy. A mighty willing worker was "Eddie," and studying stenography in his spare moments he ultimately became private stenographer to the president in 1888. Later in the same year he was transferred to the sales department at New York, and in 1891 he took over the management of the New York retail store, holding that position until the outbreak of the Spanish-American War, through which he served with the Forty-Seventh Regiment of Volunteers. After the war he re-entered the employ of the company, and in 1901 became sales manager of the New York house. He became general supply sales manager in 1907, and since that time has been in charge of the company's jobbing houses.

E. W. Rockafellow.

H. B. ZIMMERMAN, who has been general manager of the Grays Harbor Railway & Light Company, Aberdeen, Wash., for the past two years, has been transferred to the New York office of the Federal Light & Traction Company on special work. He will be succeeded by P. A. BERTRAND, formerly of Jefferson City, Mo., who will take up his duties about June 1. Mr. Zimmerman, previous to taking charge of the Grays Harbor property, was general manager of the Depew & Lancaster Light, Power & Conduit Company, and at the same time sales manager of the Niagara, Lockport & Ontario Power Company and the Niagara & Erie Company, Buffalo, N. Y.

LOUIS D. GIBBS, superintendent of advertising for the Edison Electric Illuminating Company of Boston, lectured before the Ladies' Physiological Institute in that city April 24. His subject was "Electric Service," and the lecture dealt with the economies to be effected by the general use of electric apparatus in housekeeping. Mr. Gibbs stated that 93 per cent of the heat of a coal range is unutilized, and 75 per cent of that of a gas range is lost. Washing for a family of four may be done in the home in twenty minutes, with the aid of electric flatirons and a washing machine operated by a motor. Mr. Gibbs claimed that many of the methods of household care had not been improved for 4,000 years, until electricity came to woman's aid with the modern labor-saving appliances.

E. McCLEARY, the well known electrical contractor of Detroit, was a visitor to Chicago last week. He made a very brief but eloquent address to the Jovians assembled on Monday, pointing out that although the greatest qualities of leadership might be indicated by the presiding Jupiter, his work could not be of the greatest success and usefulness unless there was the heartiest co-operation upon the part of every member of the rank and file. He believed that by working together the Jovian Order could accomplish a great measure of help in the industry and counseled the members to give heed to the suggestions made by the reigning Jupiter and act with him with every measure of intelligence they might possess. Mr. McCleary's friends will be glad to know that he has practically recovered from an illness which has kept him confined to his home for quite a few weeks.

OBITUARY.

BENJAMIN ROMAINE WESTERN, grandson of Benjamin Romaine, after whom the approach to the Martyrs Monument on Fort Greene in Brooklyn was named, died on May 1 at his home, 25 Albemarle road, Flatbush, in his seventy-third year. He was president and treasurer of the Manufacturers Publicity Corporation and a member of the Brooklyn Institute of Arts and Sciences, the Society of Old Brooklynites, Stella Lodge, F. & A. M., and Long Island Council, R. A. Three daughters, three sons and fourteen grandchildren survive him.

DATES AHEAD.

Order of Railroad Telegraphers. Baltimore, Md., May 13.

National Fire Protection Association. Annual meeting, New York, N. Y., May 13-15.

American Institute of Electrical Engineers. Annual meeting. New York, N. Y., May 20.

Association of Railway Telegraph Superintendents. Annual meeting, St. Louis, Mo., May 20.

New England Electric Vehicle Association and the Electric Motor Car Club of Boston. Joint meeting, Boston, Mass., May 20-21.

American Society of Mechanical Engineers. Spring meeting. Hotel Belvedere, Baltimore, Md., May 20-23.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 21-24.

Electrical Supply Jobbers' Association. Spring meeting, Congress Hotel, Chicago, Ill., May 26-28.

National District Heating Association. Fifth annual convention, Indianapolis, Ind., May 27-29.

National Electric Light Association. Annual convention, Medinah Temple, Chicago, Ill., 2-5.

Canadian Electrical Association. Annual convention, Fort William, Ont., June 23-25.

Electrical Contractors' Association of the State of Missouri, Annual meeting, St. Louis, Mo., July 12.

National Electrical Contractors' Association. Annual meeting, Chattanooga, Tenn., July 16.

Michigan Section, National Electric Light Association, Annual convention, Ottawa Beach Hotel, Ottawa Beach, Mich., August 18-21.

With the Electrical Manufacturers

Westinghouse, Church, Kerr & Company has moved to new offices at 37 Wall Street, New York City.

The Trumbull Electric Manufacturing Company, Plainville, Conn., has prepared folders calling attention to important points in the construction of its "Circle T" snap switches. Among the points emphasized are the smooth, flexible action, pleasing appearance, strong mechanism, ease of wiring and resultant long life.

Sherwin-Williams Company, Cleveland, O., has published a new catalog devoted to a description of Ajax insulating varnishes and impregnating compounds. This catalog is very interesting and instructive because of the technical information presented and the many illustrations relating to important tests and use of these materials.

Crocker-Wheeler Company, Ampere, N. J., has issued bulletin No. 152. This describes the company's steam-turbine-driven generators for alternating current and direct current. These are high-speed units and are made for a great variety of voltages. The bulletin describes their construction in considerable detail and illustrates typical machines and parts thereof, as well as quite a number of complete units installed.

General Electric Company has obtained permits from the city of Lynn, Mass., to erect five new buildings as an addition to its plant in that city. One of the structures will be 191 by 61 feet, of three stories and built of reinforced concrete. Another building two stories in height, 152 by 48 feet, will be for the storage of oils. The third is an addition to factory 74A, and will be 200 feet long by 30 feet wide. Another storage building 80 by 60 feet, and a plating department 180 by 60 feet, will be added to the company's extensive Lynn works.

Hoskins Manufacturing Company, Detroit, Mich., has issued bulletin No. 3. This is a 48-page publication devoted to thermo-electric pyrometers. These instruments are suitable for temperatures above the range of ordinary thermometers and up to about 2,500 degrees Fahrenheit. They consist essentially of a thermo couple, connected to a direct indicating instrument of the D'Arsonval type. The latter may be a portable wall or switchboard instrument and may be used with a recording apparatus also. The bulletin describes the instrument and its action in detail, together with valuable auxiliaries and compensating devices. Many valuable suggestions for pyrometer users are also given.

Platt Iron Works Company, Dayton, O., announces that all departments were put in full operation on April 21. While it is true that the company suffered considerable damage, the buildings were practically uninjured. The company has recovered more quickly than was anticipated. The second day after the water subsided steam and fire pumps were put in operation and the work of removing the mud and debris was started. A small portion of the plant was put in operation on April 7, the entire organization responding most loyally towards getting the plant in operation, irrespective of the fact that many of them suffered personal loss due to the flood.

Hartford Time Switch Company, Hartford, Conn., has ready for distribution a very interesting bulletin describing and illustrating the Hartford time switch. This gives full information with regard to the adaptation of the time switch and its utilization to the merchant, electrical contractor, central station, and its work in connection with show windows, electric signs, storage batteries, railroads, banks and other installations. This salesmen's sheet is prepared especially for the use of jobbers' salesmen. The information is so concise and complete, however, that it should be in the hands of everyone interested in the subject. Copies will be sent upon request.

New Process Gear Corporation, Syracuse, N. Y., has issued a 64-page book entitled "Noiseless Gear Driving." This is a treaties on the silent transmission of power on machine tools, power-plant apparatus and miscellaneous machinery, as accomplished by the New Process rawhide gears and pinions. Sections of 11 types of rawhide gears are shown and prices of nearly 2,000 sizes of pinions are given, which are either in blank or cut and ready for use. Much valuable information is given respecting the use of rawhide gears and numerous illustrations are given of the large metal gear-cutting department of the company, which claims to have the largest plant in the world devoted exclusively to the manufacture of gears.

Kimble Electric Company, Chicago, Ill., has moved its manufacturing plant to a large new building at the corner of Erie Street and Western Avenue. This removal gives the company practically three times the available floor space that it had at its former premises and this increase, together with improved facilities, has given the company approximately six times the producing capacity that it formerly had. The business of the company has developed very rapidly. In 1904 Austin Kimble began to build his first motor in an improvised shop located in a barn in which the only power available was a second-hand automobile engine. A year later a small machine shop was opened on Lake Street. The following year the second-story of a machine shop at Adams and Paulina Streets became his headquarters. In the next year the company was incorporated and its plant was moved to 1221 Washington Boulevard, where it occupied one floor. Soon afterwards the second floor of the same location had to be acquired to accommodate the increase in business. The development of the Kimble motor, which differs radically from other types, has required the courage and perseverance of Mr. Kimble and his associates, but despite a great variety of difficulties the reputation of this machine has been successfully established and the business of the company has steadily grown, as outlined above.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports the following among important orders received: Philadelphia Rapid Transit Company, Philadelphia, Pa., one 3,000-kilowatt, 600-volt direct-current, six-phase, 25-cycle, commutating-pole, alternating-current self-starting rotary converter, with three 1,100-kilovolt-ampere, 13,200 volt, single-phase, 25-cycle, air-blast transformers; also

four 2,000-kilowatt similar rotary converters with 12 735-kilovolt-ampere similar transformers. Philadelphia Electric Company, Philadelphia, Pa., two 1,500-kilowatt, 270-volt, direct-current, two-phase, 60-cycle, commutating-pole alternating-current and direct-current self-starting, synchronous booster-converters with four 825-kilovolt-ampere, 13,200-volt, single-phase, 60-cycle, air-blast transformers. Harwood Electric Company, Hazleton, Pa., two 150-kilowatt, three-unit, synchronous motor-generator sets, generators each 72 kilowatts 140 volts and motor 4,000 volts, three-phase, 60 cycles; also two 50-light mercury-arc rectifiers, 60 metallic-flame-arc lamps and 2,500 alternating-current watt-hour meters. Cleveland Railway Company, Cleveland, O., one 250-kilowatt, direct-current booster set, generator 200 volts, motor 600 volts. Duquesne Light Company, Pittsburgh, Pa., one 150-kilowatt, direct-current, reduction-gear turbine outfit, generator 125 volts, 900 revolutions per minute, turbine 6,000 revolutions per minute, reduction ratio 6.65 to 1. Great Western Power Company, City Electric Company, San Francisco, Cal., one 500-kilowatt, synchronous motor-generator set, 550 volts, three-wire direct current and 11,000 volts, three-phase, 60 cycles, alternating current, with direct-connected exciter and starting motor. Pacific Gas & Electric Company, San Francisco, Cal., one 1,000-kilowatt, synchronous motor-generator set, 600 volts direct current and 11,000 volts, three-phase, 60 cycles alternating current. New Orleans Railway & Light Company, New Orleans, La., one 1,000-kilowatt synchronous motor-generator set, 600 volts direct current and 6,300 volts, three-phase, 60 cycles alternating current with direct-connected exciter.

Record of Electrical Patents.

Issued by the United States Patent Office, April 29, 1913.

1,059,969. Projection Apparatus. E. Bausch, H. Bausch, G. Hommel, W. L. Patterson, and E. Sailer, assignors to Bausch & Lomb Optical Co., Rochester, N. Y. Provides both coarse and fine adjustments of the arc electrodes.

1,059,971. Temperature-Controlled Regulating Device. H. E. Beighlee, East Cleveland, O. A thermo-sensitive resistance and three other resistances are connected like a Wheatstone bridge, two of the latter resistances forming a differentially wound electromagnet.

1,059,977. Safety Instantaneous Water-Heater, G. P. Carroll, Bridgeport, Conn., and F. N. Roehrich; said Roehrich assignor to said Carroll. Includes electric means for turning on and lighting a gas burner when water is drawn and shutting off the gas when the water stops flowing.

1,059,988. Combined Automatic Sender and Telegraph Key. D. I. Garretson, New York, N. Y. A special transmitting key.

1,060,006. Cable Clamp. E. W. Marshall, assignor to J. E. Ogden, Brooklyn, N. Y. An angular bracket with the outer portion upwardly curved to fit partly around the cable is held to the wall by a screw into whose head a bridle ring is threaded.

1,060,011. Flush Receptacle. W. J. Newton, Lynbrook, N. Y., assignor to Metropolitan Electric Manufacturing Co. Has inwardly swinging spring flaps normally closing the face plate.

1,060,012. Float-Valve for Centrifugal Compressors. F. E. Norton, assignor to General Electric Co. Shuts off power from a motor-driven air compressor, when a backward flow occurs.

1,060,014 to 1,060,016. Cable Clamp. J. E. Ogden, Brooklyn, N. Y. Modification of No. 1,060,006, in which the part of the clamp embracing the cable is turned down and the bridle ring is separately secured.

1,060,028. Valve or Controlling Device. T. J. Rorke and E. Rorke, Barnes, England. Includes an electromagnetic contact-making fluid-chamber tilter.

1,060,042. Vaporizer for Internal-Combustion Engines. N. B. Wales, Boston, Mass. Has an electric heater in the tube.

1,060,055. Trolley Wheel. J. W. Anderson, Hamilton, Ont., Can., assignor of one-half to Allith Manufacturing Co., Ltd. Has lubricating reservoirs on each side of the tread portion.

1,060,061. Electric Flatiron. R. Boomer, assignor to Florence Electric Tray Co., Detroit, Mich. Covers details of the heating unit.

1,060,078. Process of Making Manganese Steel. A. E. Greene, assignor to American Electric Smelting & Engineering Co., St. Louis, Mo. Ferromanganese and molten steel are charged into an electric furnace and then heated.

1,060,082. Motor-Control System. J. H. Hall, assignor to Electric Controller & Manufacturing Co., Cleveland, O. Includes relay control for the main switch.

1,060,092. Electric-Motor Truck. C. H. Howard and H. M. Pflager, assignors to Commonwealth Steel Co., St. Louis, Mo. An extension of the motor housing is held by a loop and springs in a flanged transom of the truck.

1,060,109. Pump. J. J. McIntyre, Hartford, Conn. The cylinder of an explosion engine has a special spark plug in a stem.

1,060,117. Railway Signaling System. T. H. Patenall, assignor to Union Switch & Signal Co., Swissvale, Pa. Provides electrical control for two staff instruments.

1,060,118. Railway Signaling System. T. H. Patenall and H. S. Young, assignors to Union Switch & Signal Co. Covers further details of the foregoing.

1,060,182. Ignition Magneto. A. L. Heizer, assignor to Vesta Accumulator Co., Chicago, Ill. Includes adjustable pole pieces and an adjustable timing mechanism.

1,060,207. Electric Switch. F. C. Newton, assignor to Hart & Hegeman Manufacturing Co., Hartford, Conn. A push-button wall switch for controlling separate circuits.

1,060,208. Means for Regulating the Speed of Direct-Current Motors. H. Osborne, assignor to Siemens-Schuckert Werke, G. M. B. H., Berlin, Germany. A separately excited motor is supplied from a generator, for whose excitation there are two auxiliary dynamos.

1,060,211. Desk Telephone. A. C. Reid, assignor to Cracraft, Leich Electric Co., Genoa, Ill. Relates to the switching mechanism in the base.

1,060,212. Selective Signaling System. C. S. Rhoads, Jr., Sandwich, Ill., assignor to General Railway Equipment Co. Relates to the electromagnetic step-by-step signal receivers at the substations.

1,060,214. Signaling System. H. O. Rugh, Sandwich, Ill., assignor to General Railway Equipment Co. Each calling station has two electric call boxes with relays and lamps.

1,060,216. Bifunctional Storage-Battery Plate. A. O. Tate, Toronto, Ont., Can. Alternate positive and negative strips, insulated from each other, are assembled in a single plate, the positions being electrically connected to a busbar at the bottom and the negatives similarly connected at the top.

1,060,231. Ignition Device for Internal-Combustion Engines. H. O. Cram, assignor to Bridgeport Motor Co., Bridgeport, Conn. Relates to the control of the make and break devices.

1,060,252. Motor Controller. J. H. Hall, assignor to Electric Controller & Manufacturing Co. Has electromagnetic switches for cutting out rotor resistances of an induction motor.

1,060,263. Electrically Heated Utensil. J. F. Lamb, assignor to Landers, Frary & Clark, New Britain, Conn. Coffee percolator.

1,060,264. Heating Element. J. F. Lamb, assignor to Landers, Frary & Clark. A valve plate is located between one side of the resistance and the adjoining radiating surface.

1,060,265. Electrically Heated Device. J. F. Lamb, assignor to Landers, Frary & Clark. Disk stove.

1,060,266. Protective Device for Electrically Heated Utensils. J. F. Lamb, assignor to Landers, Frary & Clark. Has a tubular fusible connector in the circuit of, and adjacent to, the heating element.

1,060,267. Electrically Heated Utensil. J. F. Lamb, assignor to Landers, Frary & Clark. The base of the vessel has a socket fitting over an expansible plug on the heating-element holder.

1,060,268. Electrically Heated Device. J. F. Lamb, assignor to Landers, Frary & Clark. Covers further details of the foregoing; the plug expands by the heat and makes a more perfect heat-conducting fit with the socket.

1,060,278. Electric Candle. S. T. A. Nelson, Chicago, Ill. A Christmas-tree candle with miniature incandescent lamp at the top.

1,060,299. Motor Controller. E. B. H. Tower, Jr., assignor to Cutler-Hammer Manufacturing Co., Milwaukee,

Wis. Has automatic electromagnetic accelerating switches.

1,060,308. Intercommunicating Telephone System. L. D. Barrows, assignor to American Telephone & Telegraph Co. Permits intercommunication between local stations and communication over a trunk line with a central station.

1,060,325. Telegraphy. P. B. Delany, South Orange, N. J. Includes a transformer whose primary is controlled by an interrupter

1,060,341. Trolley Catcher and Retriever. E. L. Jewett, Brooklyn, N. Y. Has an adapter or intermediate link of special construction.

1,060,346. Battery Well. C. F. Massey, Chicago, Ill. For railway-signal batteries; has a spring cover.

1,060,375. Portable Electric Light. D. H. Stoehr, Oak Park, Ill. Has a sheet-metal base and a one-piece glass shade completely covering the lamp and base.

1,060,380. Electric Clock. W. H. Thompson, assignor to National Display System, Memphis, Tenn. Electromagnetically actuated means for storing energy in the driving mechanism.

1,060,382. Electric Arc Lamp. J. Thulin, assignor of one-fourth each to L. A. Ferguson and P. J. Smith, Chicago, Ill., and one-fourth to C. F. Eastman. A small adjustable vent for the inner globe.

1,060,383. Stopping Device for Electric Hoists. H. S. Valentine, assignor to Reading Crane & Hoist Works, Reading, Pa. Interconnection of the

1,060,015.—Cable Clamp.

driving and controller shafts through sheaves, belt and gears.

1,060,384. Electric Brake for Hoists. H. S. Valentine, assignor to Reading Crane & Hoist Works. Is controlled by a solenoid.

1,060,398. Electric Train-Signaling and Controlling Means. A. J. Allard, assignor of one-third each to T. F. Green and D. R. Creecy, Jr., Richmond, Va. A block system with low and high-resistance relays at the ends of each block.

1,060,399. Electrical Train-Controlling Means. A. J. Allard, assignor of one-third each to T. F. Green and D. R. Creecy, Jr. Electromagnetic control for the brake lever.

1,060,400 to 1,060,403. Electric Train-Signaling and Controlling Means. A. J. Allard, assignor of one-third each to T. F. Green and D. R. Creecy, Jr. These four patents cover further details of the system in No. 1,060,398.

1,060,404. Train-Controlling Means. A. J. Allard, assignor of one-third each to T. F. Green and D. R. Creecy, Jr. A shoe actuated by a track hump governs the brake valve electromagnetically.

1,060,405. Electric Train-Signaling and Controlling System. A. J. Allard, assignor of one-third each to T. F. Green and D. R. Creecy, Jr. Describes the circuit-shifting means at the ends of the blocks.

1,060,406. Electric Signal. A. J. Allard, assignor of one-third each to T. F. Green and D. R. Creecy, Jr. Electrically controlled semaphore.

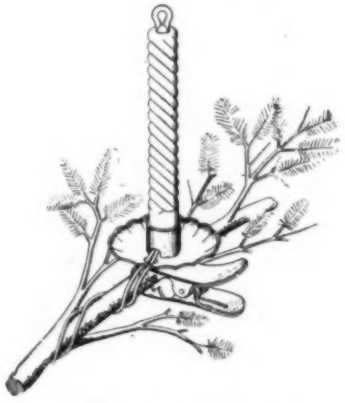
1,060,407 and 1,060,408. Electrical Block-Signaling System. A. J. Allard, assignor of one-third each to T. F. Green and D. R. Creecy, Jr. Cover further features of the foregoing systems.

1,060,410. Method of Producing Gas. J. N. Alsop, assignor to Alsop Electrical Co., Owensboro, Ky. A preservative gas is formed by subjecting air to the action of an electric arc and bringing into contact therewith the vapor of wood.

1,060,451. Trolley Guard. W. M. Hard, Centerville, Md. Has guard fingers on each side of the wheel.

1,060,468. Primary Battery. H. E. R. Little, New York, N. Y. A modified form of Leclanche cell providing for directing chlorine gas to the surface of the electrolyte.

1,060,509. Process for the Manufacture of Aluminium Nitride. O. Serpek, assignor to Société Generale des Nitrures, Paris, France. An electric-furnace process.



1,060,278.—Electric Candle.

1,060,516. Burglar Alarm. P. A. Vanhauter, Lodi, N. J. The circuit is closed when some wires are cut or pulled.

1,060,519. Electric Sign. W. H. Weeks, New York, N. Y. The letters are first flashed in disorderly fashion and then in assembled words.

1,060,539. Electric Signal-Box. J. Derby, New York, N. Y. A fire-alarm box.

Patents That Have Expired.

The following is a list of electrical patents (issued by the United States Patent Office) that expired May 5, 1913.

559,349. Rheostat. W. S. Andrews, Schenectady, N. Y.

559,356 and 559,357. Electric Railway. H. Brandenburg, Chicago, Ill.

559,366. Switchboard for Telephone Exchanges. J. P. Davis, New York, N. Y.

559,367. Switching Apparatus for Telephone Exchanges. J. P. Davis.

559,376. Composition for Electric Insulation and Process of Making Same. A. Gentzsch, Vienna, Austria-Hungary.

559,380. Electric Motor and Motor-Generator. L. Gutman, Chicago, Ill.

559,387. Electric Arc Lamp. A. Jordan, Vienna, Austria-Hungary.

559,397. Electric Signaling Apparatus. T. G. Morse, Erie, Pa.

559,403. Electric-Light Attachment for Gas Fixtures. P. W. Remig, Brooklyn, N. Y.

559,407 and 559,408. Electric Arc Lamp. C. E. Scribner, Chicago, Ill.

559,409. Telephone Circuit for Police Boxes. C. E. Scribner.

559,410. Apparatus and Circuit for Telephones. C. E. Scribner.

559,411. Apparatus for Telephone Switchboards. C. E. Scribner.

559,412. Electric Arc Lamp. R. Segerdahl, Chicago, Ill.

559,416. Electric Push-Button. G. J. Soper, Brooklyn, N. Y.

559,419. Inductor Dynamo. C. P. Steinmetz, Schenectady, N. Y.

559,476. Telephone Transmitter. L. D. Appleman, Waynesborough, Va.

559,479. Telegraphic Relay. C. G. Burke, Brooklyn, N. Y.

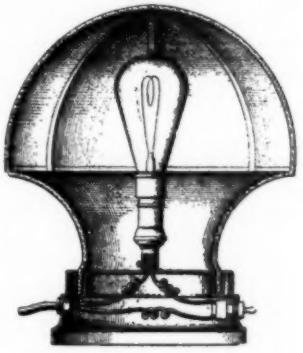
559,518. Automatic Time-Recording Instrument. H. F. Eaton, Quincy, Mass.

559,529. Electrical Safety-Lock for Elevators. A. C. Hunt, Denver, Colo.

559,530. System of Electrical Distribution. J. F. Kelly, Pittsfield, Mass.

559,531. Dynamo-Electric Machine. J. F. Kelly.

559,535. Electric Belt. G. N. Moore and R. C. MacCulloch, New York, N. Y.



1,060,375.—Portable Lamp.

559,538. Pillow Block for Dynamo-Electric Machines and Means for Supporting Same. P. W. Power, Pittsfield, Mass.

559,576. Electric Railway Signal System. L. J. Everest, Omaha, Nebr.

559,584. Dynamo-Electric Machine. J. F. Kelly, C. C. Chesney, and P. W. Power, Pittsfield, Mass.

559,585. Electric-Current Regulator. A. S. Krotz, Springfield, O.

559,586. Electrical Contact Device for Subways or Conduits. A. S. Krotz, Springfield, and W. P. Allen, Chicago, Ill.

559,613. Switch and Signal Mechanism for Railroad Crossings. J. G. Schreuder, Wilkinsburg, Pa.

559,616. System of Current Supply for Telephones. C. E. Scribner, Chicago, Ill.

559,648 and 559,649. Electric Arc Lamp. M. Wheless, Washington, D. C.

559,685. Rheostat. H. P. Davis, Pittsburgh, Pa.

559,692. Amature for Electric Motors and Dynamos. J. P. B. Fiske, Alliance, O.

559,701. Conduit for Electric Lines. J. Graizier, Geneva, Switzerland.

559,721. System of Electrical Distribution. B. G. Lamme, Pittsburgh, Pa.

559,752. Electric Arc-Lamp Carbon. J. Roubal, Prague, Austria-Hungary.